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SIR ERNEST ROCK CARLING, LL.D., F.R.C.S., F.R.C.P., F.F.R.
CONSULTING SURGEON, WESTMINSTER HOSPITAL

and

SIR JAMES PATERSON ROSS, K.C.V.O., M.S., F.R.C.S., F.A.C.S.
SURGEON AND DIRECTOR OF SURGICAL
CLINICAL UNIT, ST. BARTHOLOMEW'S HOSPITAL,
PROFESSOR OF SURGERY, UNIVERSITY OF LONDON

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PUBLISHERS' ANNOUNCEMENT

This 1955 *Progress Volume* is the fifth of an annual series of supplements to *British Surgical Practice*. By this means the eight volumes of the main work are kept up to date in the ever-increasing field of surgical knowledge by original articles, critical surveys and abstracts.

The Noter-up section will guide the reader to all supplementary articles or to critical surveys of each subject mentioned in the main work; this also applies to all abstracts. Non-subscribers to the main work will still find the Noter-up section of value, in that it is arranged alphabetically, and at a glance, information can be gained from the publication of all recent material on any particular subject. Consequently, the Progress Volume can be used independently.

Every article in the main volumes of *British Surgical Practice* has a Key Number, which appears at the commencement of each chapter and also at the top left-hand corner of every right-hand page In order to ascertain whether there has been any recent advance in the particular subject to which reference is being made, the reader should merely turn to the appropriate Key Number which appears in the left-hand margin of the Noter-up section. He will there find either a note that no further references appear or information as to the type of new matter incorporated by way of article, survey or abstract This is amplified by a brief outline of the content of the recent addition

Subscribers who turn direct to the abstract section will find that here also the keyed arrangement has been followed.

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PART II—CRITICAL SURVEYS

CONTENTS

INTRODUCTION

ONCE AGAIN we wish to express our gratitude to the authors who have contributed to this annual volume, and to those who sent us their articles many months ago we must add an apology for the delay in publication.

A prominent feature of this volume is the emphasis laid upon the post-operative period of repair and convalescence Dr. Austin Eagger gives a record of surgical rehabilitation in the Slough Industrial Health Service, Dr J. R F. Mills of Toronto has summarized current views on Early Ambulation; Professor Geoffrey Hadfield has written a scholarly account of the Pathology of the processes of Repair, and Necrotizing Enteritis, an unfortunate and alarming complication of gastro-intestinal surgery, is ably described by Mr J. M. Pullan

Some of the more spectacular surgical innovations include an article by Mr. E W Riches and Dr. C. G. Whiteside on Abdominal Aortography, with special reference to its value in urology; Adrenalectomy for cancer of the breast and prostate by Sir Stanford Cade, and Mr W J. Dempster's review of Organ Transplantation which provides a first-hand account of the problems and difficulties in a field of surgical endeavour which seems to offer great possibilities Of equal importance to the practising surgeon are the comprehensive accounts of Hydro-ureter (particularly in childhood) by Mr Innes Williams, and of Thyroiditis by Mr. Selwyn Taylor, and the timely review of the treatment of Carcinoma of the Pancreas by Professor C. F W Illingworth gives a clear indication of what surgery has to offer for this disease.

Mr W D Coltart's description of Fractures and Dislocations of the Talus, based largely on experience gained in the Royal Air Force, fills a gap in the original British Surgical Practice, and this is true also of the article by Sir Gordon Gordon-Taylor who writes from ripe experience of the operation of Hindquarter Amputation. The articles by Dr W R Cole of the University College Hospital of the West Indies o the fascinating radiological changes in the bones in sickle cell anaemia and yaws ar illustrated by skiagrams from his unique collection which are of outstanding valu though they have unfortunately lost in reproduction some of the exquisite detail c the original films.

It seemed to us that the time had come for a review of recent advances in pre operative and post-operative medication and this has been contributed by Di Langton Hewer, and also for an account by Mr Dennis Barker of the changes i the Law in relation to surgery which have occurred since Dr Levitt wrote the origin article in Volume 5 A critical examination of the original volumes gives one th impression that much of the material which was up-to-date at the time they wer written needs to be overhauled and re-arranged—in fact that a new edition o British Surgical Practice will soon be required.

E ROCK CARLIN(
J PATERSON ROS

ABDOMINAL AORTOGRAPHY

By E. W. RICHES, *M.C.*, M.S, F.R C S,
SURGEON AND UROLOGIST, THE MIDDLESEX HOSPITAL, LONDON,
and
C. G. WHITESIDE, B.M., B CH, D M.R.(D), F.F.R.,
ASSISTANT RADIOLOGIST, THE MIDDLESEX HOSPITAL, LONDON

Definition

A radiological examination, consisting essentially of the introduction of a radio-opaque contrast medium into the abdominal aorta in order to study that vessel, its branches and certain viscera supplied by them, particularly the kidneys.

Historical

The way to clinical peripheral arteriography was opened by the discovery of the radio-opacity of inorganic iodine by Cameron (1918), and early successful results were reported in France (Sicard and Forestier, 1923), Germany (Berberick and Hirsch, 1923) and in the United States of America (Brooks, 1924). In Lisbon, Moniz (1927) developed cerebral arteriography.

Two years later Reynaldo dos Santos (1929a) first published his technique and results of abdominal aortography using the translumbar approach, spinal anaesthesia, and a 100 per cent sodium iodide solution as contrast medium. Criticism and controversy arose over the safety of the method, particularly in the United States of America where the adverse experimental report on dogs by Henline and Moore (1936) did much to hinder the general adoption of the examination. Nevertheless dos Santos' technique and original findings remain virtually unchanged today, mainly due to Nelson, Doss, Wagner and others in America who did not allow the method to fall into disrepute and disuse.

The advent of the organic iodides with their lower toxicity, diminished irritation and pain and particularly their nephrographic effect made the examination safer and offset the slight loss of contrast dos Santos (1929b) foresaw the importance of aortography to urology and illustrated subsequently in 1934 the changes in renal atrophy, hypertrophy and neoplasm The examination, neglected in Great Britain for many years until Griffiths (1950) first reported a series of urological cases, has now found a definite place in urology and more recently in vascular surgery.

Contra-indications

The only positive contra-indications are renal insufficiency and sensitivity to diodone In the latter case sodium acetrizoate solutions can often be used, we have used a 70 per cent solution of this substance

TRANSLUMBAR AORTOGRAPHY

The apparatus required is simple (Fig 1). A 15 centimetre needle of 16 S.W.G is [illegible] with warm intra-[illegible]. The 30 millilitre [illegible]ature.

Apparatus

Manual film changing

A simple wooden tunnel measuring 20 × 12 × 2 inches covered with an appropriate stationary grid upon which the patient lies prone is all that is required (Fig. 2).

In renal cases a small cone giving a 12 inch diameter circle centred over the kidneys is used with a series of four 15 × 12 inch cassettes fed transversely through the tunnel. In vascular cases the whole abdomen including the upper ends of the femoral arteries may be shown on longitudinally placed 17 × 14 inch cassettes using a larger cone. With practice two operators, one on each side of the tunnel, and a radiographer at the control table can combine as a team to produce films at 1½–2 second intervals without risk of movement. In this way it is possible to get at least two films in the arterial phase

Mechanical film changing

Many simple hand-operated machines have been described and are comparatively cheap to build. The rate of exposure is, however, seldom faster than one per second The Swedish changers of the Elema or Schonander type are ideal but expensive and exposures can be selected at varying rates from 1 to 12 per second These ensure that films are taken at the optimum time in the arterial phase, which in renal cases is during ventricular systole. In our experience, however, adequate results are obtainable at rates of 1–2 seconds per film.

One advantage of a mechanical changer is that it affords greater protection for the team from overdosage of x-rays. We insist on the use of protective lead aprons.

The appropriate preliminary film is taken with the lead marker on the estimated position of D 12, the patient lying prone on the changer This serves to ensure correct exposure factors (average 80 Kv 300 ma 0·1 second at 45 inches anode film distance), position and preparation of the patient and the position of the lead marker relative to the body of D 12, the site of intended puncture The time should not exceed 0·2 second and the film should be without undue contrast and of even gradation Excess of gas or faeces in renal cases may render interpretation difficult and, if they are present, the examination should be postponed.

Anaesthesia

General

Induction with thiopentone, subsequent intubation followed by gas, oxygen and Trilene is satisfactory. To arrest respiration during exposures, 30–50 milligrams of succinylcholine is very effective.

Local

With co-operative patients it is possible to insert the needle into the aorta by infiltrating the tissues ahead of the needle with local anaesthetic solution down to the aorta, then removing the local anaesthetic syringe and connecting the saline system prior to aortic puncture The patient can then co-operate by holding his breath during exposures A sensation of heat in the back and buttocks travelling down the legs during injection will be experienced

Local anaesthesia should only be used after some experience in aortic puncture has been gained. It should be avoided in unco-operative and nervous patients who may move during actual puncture with the theoretical possibility of aortic tear. For similar reasons if the patient retches following the injection it is wise to remove the needle. In our experience the examination can be conducted more quickly and smoothly under general anaesthesia which rarely lasts longer than 15–20 minutes.

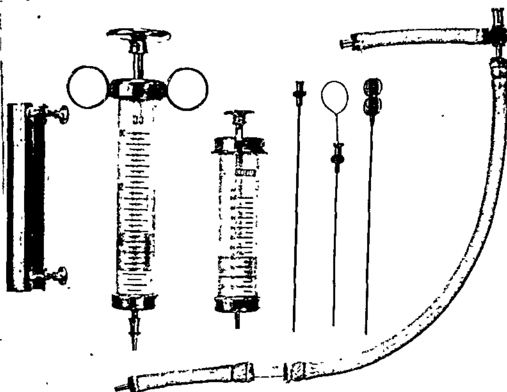


FIG 1 —Instruments for lumbar aortography Thirty-millilitre syringe with metal cover, flat-topped piston and finger-grips, for diodone Twenty-millilitre syringe for saline Needles 15-centimetre 16 S W G, for adults; 9-centimetre 20 S W G, for children, 13-centimetre 18 S W G, for adolescents



FIG 2 —Procedure Aorta punctured; the first film cassette is in the tunnel, the contrast syringe is attached and the saline syringe about to be removed Note protective lead aprons.

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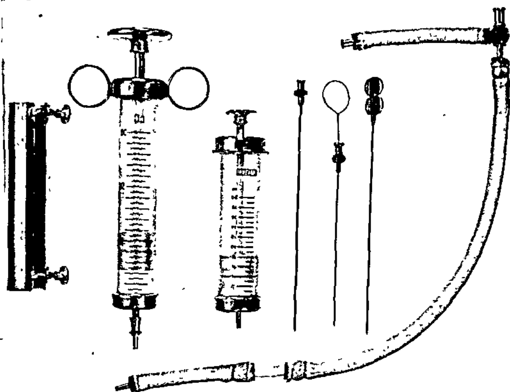


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FIG. 2 —Procedure Aorta punctured, the first film cassette is in the tunnel; the contrast syringe is attached and the saline syringe about to be removed Note protective lead aprons

Aortic puncture

The needle is introduced through the skin just below the left twelfth rib, four fingers' breadth *to the left of the midline* and directed forwards, medially and upwards to the estimated position of the body of D.12 (Fig. 3). On striking this body it is withdrawn about an inch and directed less medially (Fig. 4). *Small injections of saline help to keep the lumen clear.* Finally the needle slides past the body of D.12 and enters the aorta with a distinct sensation of diminished resistance not unlike that of thecal puncture. Blood enters the system and pushes the syringe plunger slowly backwards. The necessity for aspiration should be a warning that all is not well with the puncture.

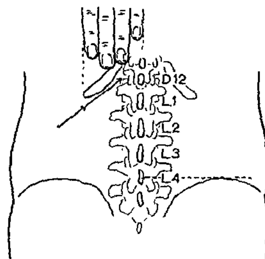


FIG. 3.—The site of cutaneous puncture and the direction of the needle.

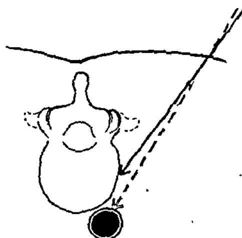


FIG 4.—After contact with the vertebral body the needle is withdrawn about one inch and directed less medially.

Experience has shown that occasionally the medium has been injected outside the aorta in spite of an apparently successful aortic tap. This is usually the result of the needle point lying partially in the aortic lumen and partially in the wall. It is good practice, therefore, to advance the needle judiciously for an eighth of an inch after puncture and, provided backflow is still satisfactory, to test its stability with a forceful injection of saline. If blood does not immediately re-enter the system the puncture is unsatisfactory and further adjustment is necessary. In children and young adults, however, it is not uncommon for the needle to puncture both walls owing to the elasticity of the aorta, in which case slight withdrawal will establish successful puncture. A smaller needle and less of the contrast medium are used in these cases. If the opposite wall has been punctured, it is common for the jet from the needle to force some medium through the hole, but the amount is usually small. If doubt still exists a test injection of 5 millilitres of diodone can be given and a film taken to confirm the position of the needle. dos Santos (1955), who uses a needle with the extremity closed and two lateral eyes, advises the routine use of a test film after the injection of 3 millilitres of contrast medium. If the needle is not accurately placed in relation to the origin of the renal arteries it is withdrawn and a fresh puncture made.

Procedure

With the first of four numbered cassettes in the tunnel the 30 millilitre syringe is attached and the anode started; the anaesthetist arrests respiratory movement (Fig. 2).

The injection of 30 millilitres of 70 per cent diodone must be made as rapidly as possible, preferably within four seconds. The first exposure is made after 15 millilitres have been injected, the second corresponds with the end of injection, and the third and

fourth two and four seconds after the injection. Saline perfusion is continued while the films are processed. A second series may be taken if required and this will be accompanied by an excretion pyelogram from the first. In our experience renal angiography is more satisfactory without simultaneous pyelography or perirenal oxygen insufflation. The nephrogram outlines the kidney adequately rendering oxygen unnecessary, and the diodone-filled pelvis and calyces tend to obscure the vessels.

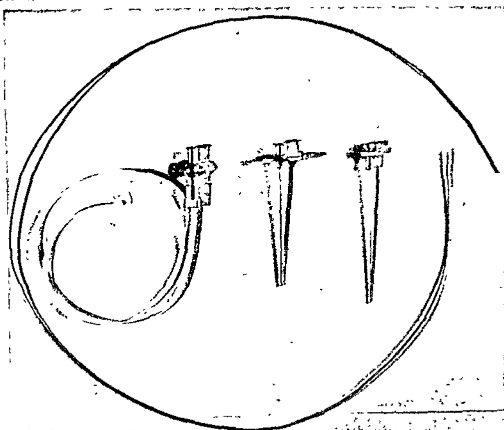


FIG 5 —Seldinger's instruments for retrograde femoral catheterization.

RETROGRADE FEMORAL CATHETERIZATION

As a result of experiencing some difficulty with aortic puncture, Farinas (1941) exposed the femoral artery and passed a catheter up to the level of the renal vessels. Pierce (1951) introduced percutaneous puncture of the femoral artery with a trocar and cannula through which a polythene catheter was passed A similar method is used by Lindgren (1953) The size of the cannula, which must accommodate a catheter of adequate dimensions (P E 200· outside diameter 1·9 millimetres; inside diameter 1 4 millimetres), is considerable. This has led Seldinger (1953) to devise a technique of catheter replacement of the trocar (Fig. 5)

Under local anaesthe… iquely as it crosses the … The cannula stretches … edle is withdrawn into the cannula once successful puncture is established and the cannula advanced up the artery The needle is now removed and immediately replaced by a wire guide of the same size so that its tip lies inside the artery just beyond the tip of the cannula. While an assistant occludes the artery proximal to the cannula by pressure the cannula is

withdrawn over the guide wire and completely removed. The wire is cleaned with a saline swab and the catheter threaded over its distal end up to the skin. The assistant releases the pressure and the catheter is advanced, being guided by the wire into the vessel Finally the wire is removed, blood follows it out and a saline syringe is attached. The catheter is then advanced upwards to the level of the renal vessels By filling it with 1 millilitre of diodone the position of its tip can be shown on the preliminary film. As the cannula and catheter have the same diameter (P.E. 200) and the hole cut in the artery is smaller, the catheter stretches the puncture and no leakage should occur. Continuous saline perfusion is unnecessary as clotting does not take place.

The advantages claimed for the method are: (1) general anaesthesia is unnecessary; (2) the catheter tip and so the contrast medium can be placed exactly where it is required; (3) there is no risk of extravascular injection; (4) oblique or lateral views can be taken easily (Farinas, 1941) Olsson (1955) who uses this technique of catheterization also claims that since the patient is in the supine position it gives a more selective filling of the renal arteries which arise more dorsally than the larger mesenteric vessels

In our hands this technique has worked quite well. Failures, however, do occur for the following reasons: (*a*) in fat people the femoral artery is difficult to puncture sufficiently obliquely or at all; (*b*) the catheter may be obstructed in its passage by tortuous iliac arteries on one or even both sides; (*c*) on two occasions the catheter passed into the deep circumflex iliac branch of the external iliac artery; (*d*) on two occasions the wire guide with the catheter perforated the external iliac vessel and caused considerable retroperitoneal haemorrhage, and (*e*) in arteriosclerotic cases, *particularly in the elderly, leakage occurs around the catheter and may be troublesome.*

For these reasons we have reverted to the translumbar technique and find it simpler, quicker and more reliable in all cases with the possible exception of aortic aneurysm. *In many vascular cases, moreover, it may be the only possible method.*

Dangers and complications

Contrast medium

Sodium iodide solutions are irritant, painful, and a frequent cause of iodism (Nelson, 1942, 1945; Melick and Vitt, 1948) and should be avoided. Indeed, most of the few recorded fataliti [illegible] following
the injection of 80 per [illegible]
an [illegible]
iod [illegible]
of [illegible]
In over 1,200 aortograms Evans (1954) reports no fatalities.

Sensitivity to diodone should be excluded either by previous pyelography or, *in* its absence, by a previous intravenous injection of 1 millilitre In such patients the examination may be safely conducted with sodium acetrizoate (70 per cent) after a similar test dose.

Thecal puncture

By directing the needle too horizontally, it is possible to puncture the theca via an intervertebral foramen and so damage the cord. This should never occur in experienced hands, but Evans (1954) quotes four cases of paraplegia or hemiplegia probably due to this cause.

Boyarsky (1954) also described a case of paraplegia following aortic injection of 10 millilitres of 70 per cent sodium acetrizoate opposite L. 2; thrombosis of the anterior spinal artery was postulated as the cause. Lindgren and Antoni (1949) attribute another similar case to the use of aortic compression.

Extravascular injection

This is accompanied by a variable amount of pain, but the medium is soon absorbed and no sequelae have been noted (Griffiths, 1950; Smith, Rush and Evans, 1951)

Haemorrhage

This is minimal after withdrawal of the needle Punctures through atheromatous plaques in arteriosclerotic aortas have also proved uneventful Occasionally there is sufficient extravasation of blood to produce an appreciable mass of blood clot which can be found at subsequent operation on the left kidney. In one patient this formed an abscess which required incision eleven months later; the pus was sterile on culture.

Anuria

Using 12 millilitres of 70 per cent diodone in 1–1½ seconds, Evans (1954) reports no cases of anuria in 1,200 punctures.

Miller, Wylie and Hinman (1954), using 50–100 millilitres of 70 per cent diodone injected by a gas-driven machine giving 70 lb per square inch pressure through one or two needles in the aorta, report seven cases of renal damage out of 250 examinations Three of these were due to low punctures directing the stream into the right renal artery or an aberrant artery and two were followed by pain, haematuria, rise in blood pressure, visible intrarenal extravasation of the medium and temporary cessation of function of the right kidney The other four cases were high punctures which developed anuria for ten days, followed by recovery They conclude that high pressures and high concentration of the medium in the renal vessels were the cause in each group These findings are a warning against the use of pressure injectors, low



FIG 6.—Normal nephrograms and excretion urogram following the injection of 60 millilitres of 70 per cent diodone

An intravenous pyelogram had been performed elsewhere two weeks before and he had had no diodone reaction.

Although we have frequently given a second injection of 30 millilitres of 70 per cent diodone for aortography it is not a practice which we now follow.

Olsson (1955) has shown that some degree of renal damage can follow even when modern organic contrast media are used; it is manifested by an increase in the non-protein nitrogen of the blood and the appearance of casts in the urine The changes are usually mild and transient but they may be serious if the amount or the concentration of the contrast medium is too great. He recommends that a dose of 20 millilitres of 60 per cent diodone or of 50 per cent sodium acetrizoate solution should not be exceeded.

We feel that too forcible an injection may also be a potential danger and for this reason consider that manual injection is safer than mechanical or gas-driven methods

AORTOGRAPHY IN RENAL CONDITIONS

Indications

(1) Congenital abnormalities; (2) differentiation of space-occupying renal lesions; (3) assessment of renal function; (4) hydronephrosis; (5) some cases of renal calculus, (6) renal tuberculosis; (7) hypertension of renal origin; (8) renal haematuria with normal excretory and retrograde pyelograms; (9) indefinite or obscure pyelographic findings; (10) when partial nephrectomy is contemplated; (11) renal infarction, (12) retroperitoneal tumour of uncertain origin.

The normal arteriogram

With the usual exposure of four films the various phases of the renal circulation can be shown. The filling of vessels other than the renal will depend on the placing of the needle-point in relation to their origin from the aorta, and as the relative levels of origin of the coeliac axis, the renal arteries and the superior mesenteric are by no means constant, it may happen that the needle may point directly at the origin of one of these vessels, for example, the coeliac axis.

This may be of use in delineating the hepatic artery prior to surgery of the biliary passages, but, as a rule, the vessel shown most prominently is the splenic artery (Fig. 8) In other cases the superior mesenteric artery and its branches may be completely outlined at the expense of the renal arteries (Fig. 9) As a rule, however, if the needle-point is opposite D.12 or the upper border of L.1 the renal arteries will be adequately filled

The first film shows the early arterial phase. The main trunk of the aorta is filled together with both renal arteries and their interlobar and arcuate branches (Fig. 10)

The second film shows a later arterial and early nephrographic phase. The definition of the smaller renal vessels depends on a correct position of the needle-point and a perfect radiographic technique; in some cases it is nearly as accurate as that obtained by the plastic injections of post-mortem specimens shown by Graves (1954) (Figs. 11 and 12)

This is the most useful single film although it must be emphasized that study of the whole series is necessary if a correct interpretation is to be made.

The third and fourth films show the nephrogram and in favourable cases the early venous phase The maximal concentration of diodone by the renal cortex is seen about 4 seconds after the injection (Johnstone, 1952) when a dense shadow of the kidney substance appears (Fig. 13) The renal cortex and medulla can be distinguished and areas of cortical destruction appear as translucent defects. In the fourth film the splenic and renal veins are sometimes seen.

Excretion urograms

Further films exposed 5, 15, and 30 minutes after the injection will show all the

FIG 8—Filling confined to the coeliac axis and its branches, the needle-point is opposite the centre of the body of D 12

FIG 9—Filling of the superior mesenteric artery, the needle-point is opposite the space between D.12 and L 1



FIG 10.—Normal arteriogram (film 1) In this case retrograde pyelography and perirenal oxygen insufflation had been previously performed.

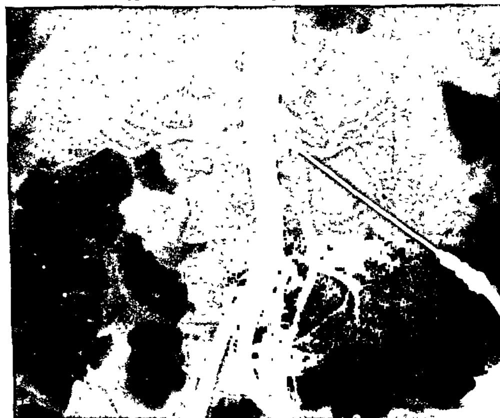


FIG 11.—Normal arteriogram (film 2) There is a small stone in the lowest calyx of the left kidney The lower segmental artery was ligated before partial (lower polar) nephrectomy.

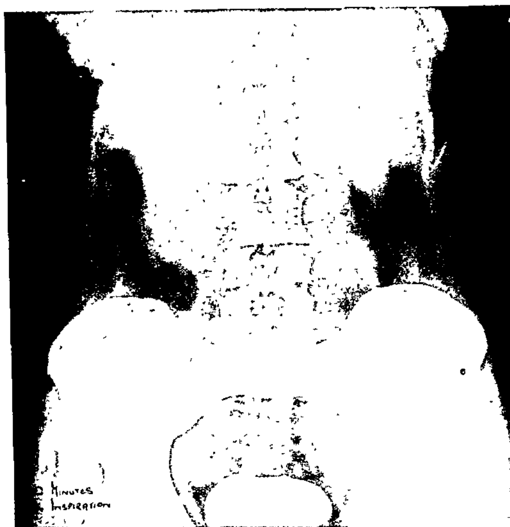


FIG 14—Excretion urogram 30 minutes after aortography. There is an area of tuberculous calcification in the right kidney.

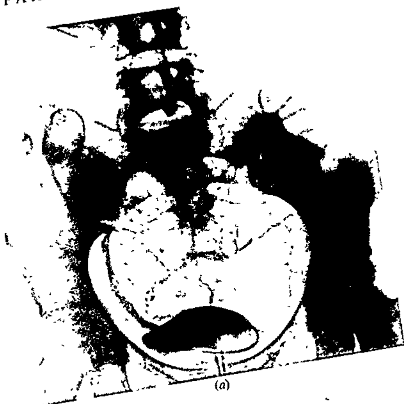
details normally obtained by intravenous urography, the one investigation can therefore take the place of two (Fig 14).

The abnormal arteriogram

Congenital renal abnormalities

Whilst it is not intended to discuss all the numerous congenital anomalies which affect the upper urinary tract it may be stated that renal angiography plays an important part in their investigation It is especially indicated when surgical treatment is contemplated

Anomalies of number—The ultimate confirmation of the complete absence of one kidney may rest on the aortogram When cystoscopy discloses the absence of one ureteric orifice and of one-half of the trigone the absence of a kidney on that side may be presumed, but when both orifices are present the condition must be verified by the absence of a renal shadow, a renal artery and a nephrogram on aortography. Distinction from extreme hypoplasia or complete destruction of the kidney is not always possible The solitary kidney is itself often the seat of dilatation or other abnormality which would determine its removal if there were a good kidney on the other side; in its absence conservative treatment is mandatory (Fig 15)



(*a*)



(a) (b)

FIG. 18.—(a) Pelvic ectopic left kidney (retrograde pyelogram) (b) Arteriogram and specimen of (a) Two arteries from the aortic bifurcation and two from the left hypogastric artery supply the kidney. Early nephrogram just visible

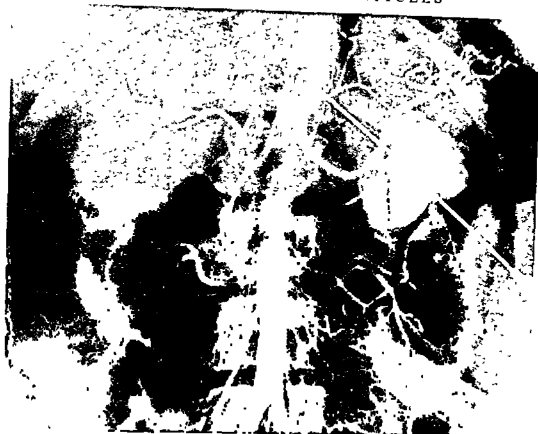


FIG 19 —Left double kidney with a stone in the upper half The artery to the upper half, seen below the splenic, was small, and that to the lower half adequate Left hemi-nephrectomy

calyces Characteristically it is a vascular tumour and on angiography, although the vessels near it may be displaced, the tumour itself shows a deposit of the contrast medium within its substance which gives it a mottled appearance known as "pooling" (Fig 20 *a* and *b*) The appearance persists in the nephrogram and when seen is diagnostic of the condition. Only rarely is a cortical tumour avascular but this may *happen in a papillary cystadenoma (Salvin and Schloss, 1954) or when a cortical* tumour has invaded the pelvis extensively (Fig. 21 *a*, *b* and *c*) or when it is heavily calcified or has a thick pseudo-capsule

A metastasis coming within the radiographic field may also be filled by the contrast medium (Fig 22 *a* and *b*) The only other malignant tumour to simulate the adeno-carcinoma is the rare liposarcoma. Secondary deposits in the kidneys are usually avascular

(*b*) *Pelvic new growths.* The commoner papillary transitional cell tumour of the renal pelvis is best diagnosed by pyelography It produces no specific signs on aortography but if it is large it will displace the kidney outwards and elongate the renal artery (Fig 23 *a*) A large hydronephrosis has the same effect on the artery, but the two conditions are distinguished by pyelography (Fig 23 *b*)

The less common solid pelvic tumour, whether transitional cell or squamous cell, is always avascular, *it is more liable to produce ureteric obstruction with a resulting* hydronephrosis, when there will be an absent or less dense nephrogram although the *main vascular pattern may differ little from the normal (Fig. 24 a, b, c and d)*

If a renal pelvic tumour invades the parenchyma the growth shows as an avascular defect in the nephrogram (Fig 25 *a* and *b*)



(*a*)



(*b*)

FIG. 20.—(*a*) Retrograde pyelogram, a mass is present in the upper pole. (*b*) Arteriogram and specimen of (*a*). Classical appearance of an adenocarcinoma.

(a)



(b)

FIG 21.—See legend on opposite page.



(c)

FIG 21 —(a) Pyelogram showing a filling defect in the right pelvis suggesting a pelvic new growth. (b) Angiogram in the same patient as Fig 21a showing a depression in the nephrogram but no pooling in the neoplasm The vessel above the right renal artery is the hepatic artery. (c) Later stage of Fig 21b Although the tumour showed no pooling it was a parenchymal adenocarcinoma invading the pelvis There is an area of infarction below the tumour corresponding with the depression in the nephrogram.

Benign tumours of the kidney are rare and little is known about their angiographic appearance In a case of a large haemangioma of the pyramid we found no demonstrable changes, presumably because the capillary circulation through it was too slow to absorb sufficient contrast medium.

Renal cysts—Solitary cysts of the kidney are of surgical importance in that they may be confused with new growths. The distinction can usually be made by angiography, for the cyst is avascular and shows as a translucent defect in the nephrogram (Fig 26 *a*, *b*, *c* and *d*), characterized by a smooth well-defined curvilinear border which distinguishes it from an avascular neoplasm The vessels may sometimes be seen coursing round the periphery of the cyst. There is no pooling of the contrast medium within the cyst itself.

It should be noted, however, that Lindblom and Seldinger (1955) claim that percutaneous puncture of an expanding focus in the kidney gives a more reliable differential diagnosis between a tumour and a cyst than renal angiography.

Polycystic disease is diagnosed by pyelography; if the renal function is very poor aortography should not be performed There is, however, in a typical case a poor blood supply with widely separated vessels spread around the cysts and a patchy cotton-wool appearance in the nephrogram (Fig. 27 *a* and *b*), which might be confused with the pooling of a new growth In polycystic disease the changes are bilateral although usually more advanced on one side.



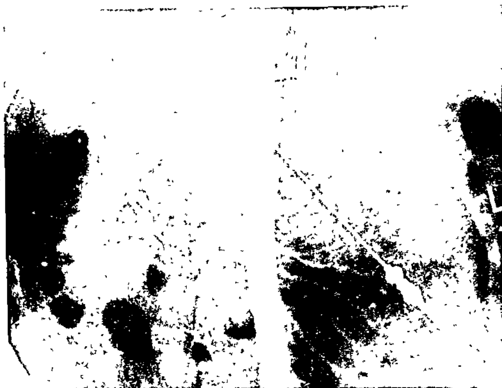
(a)



(b)

Fi ... seen just above the outer half of ... stasis in the right side of ... Pyelogram of the same ... ponds with the relatively

the 11th dorsal ... The circular filling defect in the upper calyces ... patient The circular filling defect in the upper calyces small growth seen in the superimposed kidney



(*a*)



(*b*)

FIG. 23.—(*a*) Outward displacement of the left kidney by a papillary carcinoma of the pelvis. The renal artery is of normal size. (*b*) The kidney from Fig. 23*a* superimposed on its pyelogram.

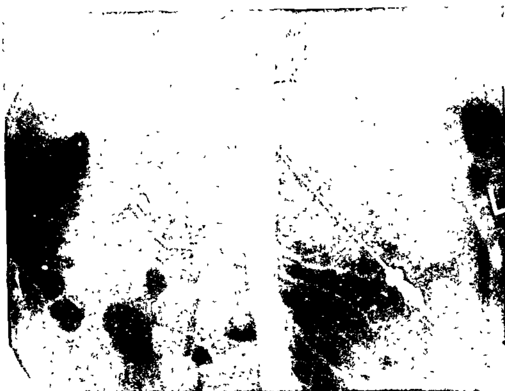


(*a*)

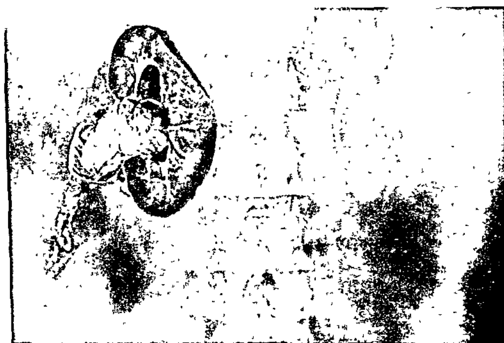


(*b*)

Fi ... (seen just above the outer half of a metastasis in the right side of tery (*b*) Pyelogram of the same yx corresponds with the relatively



(a)



(b)

FIG 23 —(a) Outward displacement of the left kidney by a papillary carcinoma of the pelvis The renal artery is of normal size (b) The kidney from Fig 23a superimposed on its pyelogram



(*a*)



(*b*)

FIG. 24.—Solid carcinoma of the right renal pelvis in a woman aged 30 years. (*a*) Pyelogram. (*b*) Aortogram. The vessels to the lower pole on the right are slightly fewer and straighter than those on the left.



(c)



(d)

FIG 24 *continued* —(c) Nephrogram In the right lower pole the nephrogram is fainter than elsewhere (d) The excised kidney The growth was a solid transitional cell carcinoma of high-grade malignancy

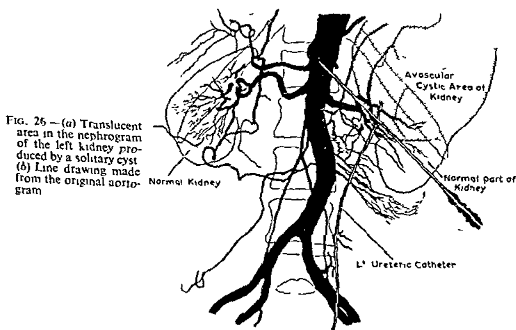


(a)

Fig. 25.—(a) Retrograde pyelogram showing destruction of the upper calyx of the left kidney. (b) Arteriogram and specimen of (a) Transitional cell carcinoma of the renal pelvis. The tumour is avascular; the remaining renal vessels are small and run to the lower pole—the only area not invaded.

(b)

(a)



(b)

FIG. 26 — (a) Translucent area in the nephrogram of the left kidney produced by a solitary cyst (b) Line drawing made from the original aortogram

Assessment of renal function

It will be seen that diminution of renal function is usually accompanied by progressive devascularization of the kidney with reduction in size of the main artery and in the size and number of its peripheral branches, and lessening in density of the nephrogram. These changes are most striking in hydronephrosis where the thinning



(c) (d)

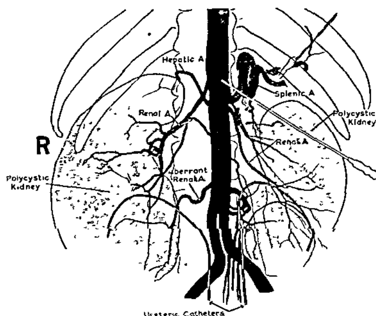
FIG 26 *continued.*—(*c*) Pre-operative and (*d*) post-operative pyelograms of the kidney shown in (*a*) Removal of the cyst abolished the space-filling lesion and left a useful kidney.

of the cortical tissue can best be appreciated but occur whenever the renal parenchyma is destroyed The assessment of renal function in these cases is superior to that given by the intravenous pyelogram and may be the deciding factor in choosing conservative or ablative treatment. The degree of function of the opposite kidney is shown at the same time.

When there is no visible excretion after intravenous urography it is customary to carry out retrograde pyelography In certain cases, particularly in the presence of tuberculous stricture of the ureter or in bladder growth, the ureteric catheter cannot be passed Under these conditions aortography is the only radiographic method of obtaining information about the kidney function (Fig. 28)



(*a*)



(*b*)

FIG 27 —(*a*) Angiogram in a case of polycystic kidneys, more advanced on the right The renal arteries are small and their branches spread around the cysts The nephrogram has a patchy appearance (*b*) Line drawing from the aortogram

ohrn (1954) has measured the width of the renal artery on each side one centi- from its origin as seen on the aortogram. He found a constant diminution in essel on the side affected by a destructive process amounting to a mean of imetres in ten cases In addition the intrarenal vessels were straighter and fewer he nephrogram was less dense on the affected side. In cases where the difference dth of the main artery was not marked recovery of renal function was possible removal of an obstruction.

These observations are of value not only in the surgery of the kidney but also where a ureteric orifice is occluded by a growth in the bladder, and the ureter cannot be catheterized. If the angiogram indicates a poor renal function it is better to remove the kidney rather than to retain a functionless organ which is liable to become infected

Hydronephrosis

Renal angiography gives valuable information in hydronephrosis; first, about the degree of renal function and secondly on the presence of aberrant vessels. Hydronephrotic atrophy is accompanied by the reduction in vascular supply which has been described above. Vessels can sometimes be seen coursing round the dilated pelvis.



FIG. 28 —Thrombosis of right renal artery following exploration for stone ten years earlier. There is also an aneurysm of the splenic artery (*see* Fig 37)

The density of the nephrogram also gives an index of function provided the needle-point is equidistant from the renal artery on each side, and the amount of cortical tissue remaining can be assessed from it (Fig 29 *a* and *b*)

The presence of polar vessels can also be noted, but whether or not they cause obstruction can only be determined by simultaneous ureteric catheterization and aortography (Fig. 30 *a* and *b*) This may sometimes succeed in showing the relation of the vessel to the pelvi-ureteric junction.

We have come to regard renal angiography as an essential investigation in all cases of hydronephrosis; the decision between conservative or ablative treatment may rest on the size of the main artery and the degree of cortical atrophy. A plastic operation will only succeed if the kidney has an adequate blood supply (Fig. 31 *a*, *b* and *c*)



(a)



(b)



(c)

ı. 31.—(a) Right hydronephrosis The kidney is displaced laterally but its blood supply adequate for a plastic operation. (b) Pyelogram of the same patient as Fig 31a, before ... . (c) Pyelogram two weeks after plastic operation.



(*a*)



(*b*)

FIG. 30 (*a*) Retrograde pyelogram in a case of right hydronephrosis showing the characteristic twist below the pelvi-ureteric junction (*b*) Arteriogram in the same case. The blood supply is diminished and the ureteric catheter hooks over an accessory artery to the lower pole



(*a*)

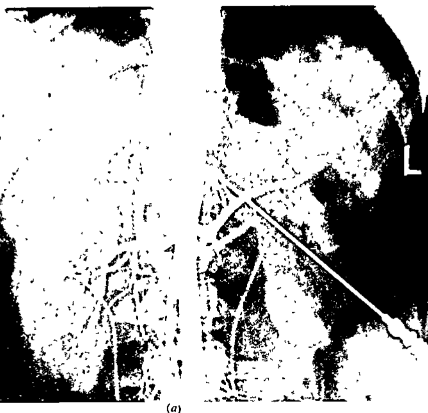


(*b*)



(*c*)

FIG 31 —(*a*) Right hydronephrosis The kidney is displaced laterally but its blood supply is adequate for a plastic operation (*b*) Pyelogram of the same patient as Fig 31*a*, before operation (*c*) Pyelogram two weeks after plastic operation.



(*a*)



(*b*)

FIG 32—(*a*) Left renal tuberculosis The nephrogram is faint, but there is no indication of the site of cavitation (*b*) The excised tuberculous kidney superimposed on its pyelogram which gives a better idea of the site of the cavities Note the tubercles studding the pelvis and ureter

Indefinite pyelographic findings

Despite the clarity of many excretion or retrograde pyelograms it is not always possible to interpret the skiagrams correctly. A renal angiogram will sometimes throw added information in cases of doubt. Fig. 35 *a* shows the intravenous pyelogram of a patient with renal haematuria of which the side of origin was not known. The aortogram (Fig. 35 *b*) showed a very small area of pooling in the right kidney and the excised kidney showed an early adenocarcinoma corresponding with it (Fig 35 *c*).



FIG 33.—Advanced left renal tuberculosis in a boy aged 11 years Diminished arterial supply to the left kidney with absence of the nephrogram. There is a faint accumulation of contrast medium in the upper pole The right nephrogram is normal.

When partial nephrectomy is contemplated

The scope of this operation is increasing and includes cases of hydrocalycosis, some cases of stone and some of renal tuberculosis If the arterial supply to the affected part can be isolated its ligature not only makes the operation more nearly bloodless, but also produces an area of cyanosis which indicates where the kidney can be safely divided Such a branch is more easily located if its position has been shown previously by angiography. The apical and lower segment arteries can usually be safely divided, as can the upper segment artery if the arrangement falls into group 2 (Graves, 1954). The posterior segment artery supplies the upper two-thirds of the posterior surface except perhaps the apex, and its division would cut off the blood supply to an extent impractical for partial nephrectomy (*see* Figs. 11 and 12).

Renal infarction

In this rare condition in which a main vessel may be partially or completely blocked by thrombosis an infarcted area will show as a translucent defect with a shrunken depressed border in the nephrogram

Retroperitoneal tumours

Aortography is sometimes of value in connexion with adrenal tumours and retroperitoneal swellings, particularly in distinguishing them from renal tumours. In

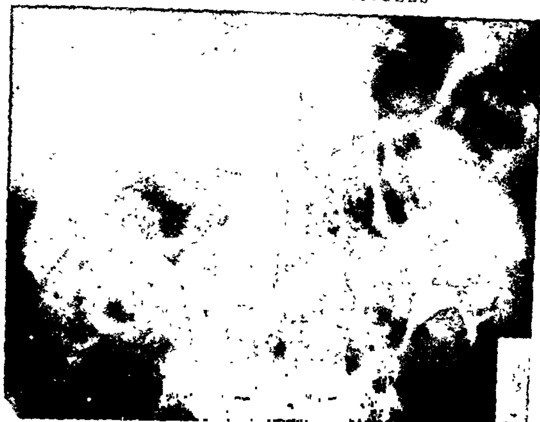


(a)



(b)

Fig. [illegible] (a) Left hydronephrosis with hyper- [illegible] was greatly reduced one year later



(a)



(b)



(c)

Fig. 35. (a) Haematuria of unknown origin: intravenous pyelogram. No gross abnor- [illegible] the same case. There is a very small [illegible] The excised right kidney showing a [illegible]

:neral, however, we have found the retroperitoneal insufflation of oxygen to be of ·eater assistance in the diagnosis of these conditions. Enlargement of the spleen can : readily demonstrated by aortography.

AORTOGRAPHY IN VASCULAR ABNORMALITIES

ıdications

) Suspected aneurysm of the aorta or its branches; (2) suspected thrombosis of the ɔrta or its branches; (3) arteriovenous fistula

[illegible] n

uently (Leriche and Morel, 1948) referred to dos Santos' work Modern surgical :chniques enabling thrombosed or aneurysmal segments of the aorta or iliac vessels) be replaced by grafts or synthetic prostheses have made aortography in vascular isease essential as a pre-operative and post-operative investigation.

ortic aneurysm

The ease of making the clinical diagnosis in some cases and the difficulty in others ;, in the words of Osler "conducive to clinical humility" Leaking aneurysms can losely mimic other conditions

The majority of aneurysms are arteriosclerotic in origin and arise below the renal rteries These are usually fusiform and occasionally are mobile, lying on one side r the other of the midline owing to the elongation of the aorta in arteriosclerosis,



FIG 36—(Mr Holmes Sellors case) Aortic aneurysm containing thrombus arising below the renal arteries The common iliac arteries are involved, with partial thrombosis of the right Successful resection and insertion of graft

consequently, vertebral erosion is uncommon Blakemore (1946) described 23 cases, 18 of which were arteriosclerotic and 5 syphilitic in origin. Only one of the former showed vertebral erosion; 4 of the latter arose above the renals, were saccular and showed vertebral erosion. Rob and Eastcott (1955) have recently described an aneurysm due to erosion by tuberculous lymph nodes with successful replacement by an Orlon prosthesis and have collected 23 similar cases from the literature, all of which were fatal.

The internal size and extent of the aneurysm, together with its relation to the renal arteries and other vessels can be demonstrated with precision by aortography (Fig. 36) The translumbar approach using a high puncture preferably at D.11 or 12 is safe with aneurysms arising below the renals In doubtful cases, however, it is probably wiser to use the femoral method, particularly as lateral or oblique views are more easily obtained



Fig. 37.—Preliminary film of the same case as Fig 28 showing calcification in the aneurysm of the splenic artery

Aneurysms of aortic branches.—The splenic artery may be involved by aneurysm which frequently shows calcification on the plain film (Figs. 28 and 37). Similar calcification may be seen in the rare aneurysm of the renal artery or in the hepatic artery (Felson, 1954). Begner (1955) showed that the radiotranslucent centre of an aneurysm of the renal artery with a calcified periphery became opaque on *aortography*, thus proving that the ring shadow was part of the renal arterial system. Aneurysms of the common iliac vessels are usually fusiform While pulsatile masses with calcification may make the diagnosis clear in many cases, aortography serves to confirm their

esence and extent and also occasionally illustrates them as an accidental finding. ther technique can be safely used in these cases.

ortic thrombosis

Leriche (1940) points out that the classical clinical features of the aortic bifurcation ndrome which occurs predominantly in young males are impotence, fatigue of the wer limbs with or without claudication, bilateral global atrophy of the legs with



Fig. 38.—Aortic thrombosis. The metallic clips date from the lumbar sympathectomy 3 years previously. Note the enlarged intercostal and subcostal vessels (*see text*).

pallor even on standing and slow healing of wounds Trophic changes are absent. Clinical investigation shows absence of the femoral and iliac pulses together with absent oscillometric changes in the legs and a slightly raised blood pressure.

Greenfield (1943) reviewed 161 cases of aortic thrombosis in the literature and added 5 of his own; in none of these, however, had aortography been used. Price and Wagner (1947) described 2 cases, both confirmed by aortography and one by necropsy. They pointed out that in such cases the visceral anastomosis between the middle colic branch of the superior mesenteric artery and the left colic branch of the

obliterated inferior mesenteric artery supplies the sigmoid colon and rectum. The systemic supply to the lower limbs is maintained via the superior epigastric branch of the internal mammary artery with the inferior epigastric branch of the external iliac artery; also via lumbar arteries and subcostal arteries with the deep circumflex iliac branches of the external iliacs and ilio-lumbar vessels.

The case shown in Fig 38 showed some of these anastomoses Ten years previously the right leg had been amputated for gangrene, 3 years ago an attack of abdominal pain had been diagnosed as mesenteric thrombosis. At the time of examination the



FIG 39 —Partial right common iliac thrombosis (*see text*).

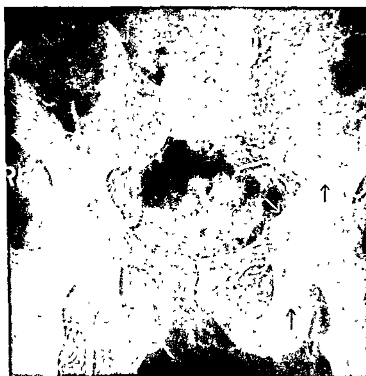
patient had a 7-year history of pain and ischaemia of the left foot and exhibited gangrene of the big toe The aorta was palpable in the epigastrium but not below, and both femoral and distal pulses were absent He had had a lumbar sympathectomy 3 years previously without relief Blood pressure 130/80.

Elliot and Peck (1952) describing 4 cases of their own quote one negative case on aortography. A similar case was published by Semple and Whiteside (1951) with impalpable femoral and peripheral pulses and negative oscillometry in a man with symptoms of lower limb ischaemia The value of aortography in excluding aortic or iliac thrombosis in such cases is obvious More important, however, is the ability of the examination to show the extent of the lesion, its relation to the renal arteries and the collateral circulation Death may occur from renal involvement, pulmonary embolus (Elliot and Peck), cerebral or coronary disease and, finally, extensive gangrene. Rob (1955), however, has 11 of his 26 cases doing sedentary work on medical treatment alone

Common iliac thrombosis —Leriche considers that the development of his syndrome starts as a progressive thrombosis in one iliac artery near its origin and spreads across the bifurcation to the other



(*a*)



(*b*)

FIG 40 —(*a*) and (*b*) Left iliac thrombosis showing collateral circulation to the patent femoral artery (*see text*).

The case shown in Fig 39 illustrates an early lesion. This patient complained of ischaemic symptoms in the right leg for 15 months. Examination showed that the pulses of both legs were present but the right was diminished compared with the left. There was ½ inch of wasting in the right thigh and the right foot was cooler than the left. A right femoral arteriogram was normal apart from diminution in size of the vessels The aortogram showed a tortuous arteriosclerotic aorta, normal left iliac vessels and a partial thrombosis of the right common iliac situated at the aortic bifurcation.

The absence of one femoral pulse is good clinical evidence of iliac thrombosis and only the aortogram can show where and how extensive the disease is, whether it is amenable to surgical grafting and what part the collateral circulation is playing. The case shown in Fig. 40 *a* and *b* had an absent left femoral pulse with ischaemic symptoms in the leg The aortogram showed a complete left iliac thrombosis and arteriosclerotic but patent right iliac vessels The left internal iliac was also thrombosed except for its terminal branches, the obturator and inferior gluteal arteries which received collaterals from the last lumbar and ilio-lumbar arteries and anastomosed with the inferior epigastric and lateral femoral circumflex vessels respectively, thus supplying the leg via the patent femoral. No active treatment was undertaken

Other cases may show collaterals via the superior haemorrhoidal branch of the inferior mesenteric to the haemorrhoidal vessels of the internal iliacs, and it is conceivable that in some cases arteriography might play a part in their management.

CONCLUSIONS

Time will show the ultimate value of aortography and whilst its use in some of the conditions mentioned in this paper may eventually be restricted there may well be further developments as new contrast media and improvements in radiographic technique arise. At present it can be affirmed that it is a valuable accessory method of diagnosis in many renal and vascular diseases, and that it is relatively safe and free from complications if due care is exercised both in the selection of cases and in the technique of its performance

(*See also British Surgical Practice*. Arteries, Vol I, page 327, S. Key 37)

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ADRENALECTOMY

By Sir STANFORD CADE, K.B.E., C.B , D.Sc., F.R.C.S , F.R.C.O.G., M.R.C.P.
Senior Surgeon, Westminster Hospital; Consulting Surgeon, Mount Vernon Hospital and Radium Institute; Consultant in Surgery to the Royal Air Force, Consultant in Radiotherapeutics to the Army

Bilateral adrenalectomy is an established surgical procedure and survival for several years on cortisone maintenance has been achieved. The indications for the operation are mainly the control of disseminated cancer of the breast and prostate, Cushing's syndrome, and selected cases of severe hypertension. In Cushing's syndrome it is accepted as the treatment of choice. In the malignant phase of hypertension it is still an experimental procedure and does not always lead to a lowering of the blood pressure although symptomatic relief is obtained.

In the treatment of patients with advanced cancer of the breast and prostate, adrenalectomy has given results so far unachieved by any other method of treatment and equalled only more recently by results of hypophysectomy. As a palliative measure, subjective and objective improvement is obtained in about 60 per cent of patients and in 50 per cent of these there is a dramatic restoration to near-normal health, lasting from 6 months to 3 years so far.

There is, however, at present no method of ascertaining beforehand whether or not the malignant growth is hormonally dependent and the operation is still undertaken only if simpler methods of treatment no longer offer relief. In successful cases it has been noticed that adrenalectomy is followed by a fall of the ketosteroids. In some patients in whom no reduction in the *ketosteroids followed adrenalectomy,* such a fall was subsequently observed after hypophysectomy. Although only cancer of the breast and prostate can be influenced by the administration and by the withdrawal of male and female sex hormones, adrenalectomy has been tried in a variety of other malignant tumours—for example, cancer of the ovaries, uterus, colon, in malignant melanoma and in leukaemia—but so far without success. The operation was first tried by Charles Huggins in 1945 but had to be abandoned until substitution therapy by cortisone became available. Huggins (1951, 1952, 1953) pointed out that the adrenal cortical hormones sustain mammary and prostatic cancer in the absence of the gonads, and that ablation of the adrenals and gonadectomy removes all known sources of sex hormones. Luft and Olivecrona (1953, 1955) reported similar findings following hypophysectomy.

ANATOMY OF THE ADRENALS

Relations and form

The left adren[illegible] ar in shape, lies [illegible] ro-medial border of the kidney in its upper t[illegible] surface is [illegible] splenic artery and the pancreas. The upper po[illegible] are in [illegible] o-medially with the diaphragm (Fig. 41)

The right [illegible] on the [illegible] ight [illegible] is, as its name implies, "a su[illegible]". It is [illegible] concave renal

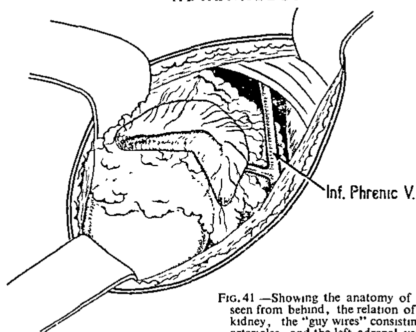
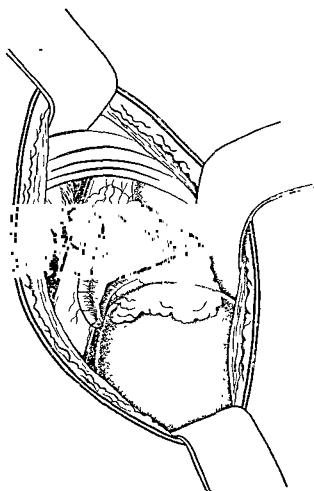


Fig. 41 —Showing the anatomy of the left adrenal as seen from behind, the relation of the adrenal to the kidney, the "guy wires" consisting of capillaries and arterioles, and the left adrenal vein and its junction with the inferior phrenic vein

Fig 42 —Anatomy of the right adrenal, similar to the left adrenal in Fig 41 The short adrenal vein is shown, entering the vena cava



surface, like a cap. Antero-laterally it is in contact with the liver and antero-medially it is moulded in close contact with the vena cava; its upper third is covered anteriorly by peritoneum (Fig. 42).

Fascial attachment

The kidney and the adrenal are embedded in a fibro-fatty layer of tissue. The fatty layer, perirenal fat, is enclosed in a fascial envelope formed at the lateral border of the kidney by the division of the transversalis fascia into a pre-renal and a post-renal layer. This renal fascia (fascia of Gerota) has a thicker layer posteriorly (fascia of Zuckerkandl) and a thin anterior layer (fascia of Toldt). The adrenal is enclosed in a compartment of Gerota's fascia and is attached lightly to the kidney below by loose connective tissue and more firmly to the diaphragm above by a thickened part of Gerota's fascia, sometimes called the suspensory ligament of the adrenal.

VASCULAR SUPPLY TO THE ADRENALS

Arteries

Reduced to anatomical simplicity, the arterial supply to the adrenal arises from three main vessels, the aorta, the inferior phrenic and the renal arteries. At operation, however, these vessels are hardly ever seen. They subdivide at a distance from the adrenal into many smaller arteries forming rami which converge on the adrenal from above, from below, and medially. The abundant arterial supply forms a fine vascular network supported on strands of fibrous tissue, likened by Huggins to "guy wires" (Figs. 41, 42 and 51). As many as 60 small arteries finally reach the adrenal.

Veins

In contrast to the arterial supply, the venous return is nearly always by one vein. On the right side a very short vein, often only 4 millimetres in length, emerges from the hilus at the apex of the gland on its antero-medial surface; this short venous trunk pursues an upward course and joins the vena cava. Exceptionally the vein emerges from the lower pole of the adrenal or two veins of equal size may separately enter the vena cava. The veins are not seen at operation until the gland is sufficiently freed to be rotated laterally (Fig. 43).

The left adrenal vein is larger and longer than the right; it emerges from the hilus at the lower pole of the anterior surface of the gland and pursues a downward course. It terminates directly in the left renal vein or more commonly enters the inferior phrenic vein as a tributary or alternatively joins it to form a single trunk which enters the renal vein (Fig. 44).

UNUSUAL SITES AND ACCESSORY ADRENALS

The adrenal may be found to be completely separate from the kidney. In such cases it is situated on the under-surface of the diaphragm, and on the right side may be lodged in a niche of the liver. The venous return of the diaphragmatic adrenal on the right side may join the vena cava in close proximity to the lower hepatic veins.

Accessory adrenals have been found in various sites: in the vicinity of the main adrenals, near the diaphragm, near the coeliac plexus, in the broad ligament, in the mesosalpinx, near the infundibulo-pelvic ligament, near the epididymis and testis and retroperitoneally along the course of the gonadal vessels. Most of the pelvic accessory adrenals are composed of cortical tissue only, in the region of the coeliac plexus, medullary tissue is found as well as cortical. Hyperplasia of the accessory cortical tissue may occur in association with hypertrophy of the main adrenals, or independently of it. Compensatory hypertrophy of aberrant or accessory adrenals

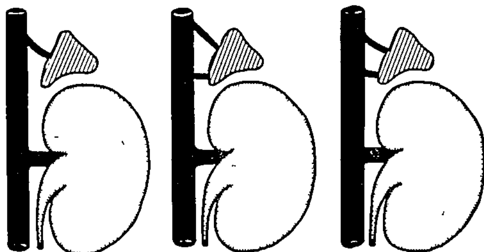


FIG 43.—Venous return from right adrenal. The diagrams illustrate a single short vein from the centre of the adrenal, two veins from upper and lower pole and two veins from centre and lower pole. These are the most commonly met anatomical variations.

following adrenalectomy may be responsible for recrudescence of hormone-controlled metastases after a period of regression following the operation

STAGES OF ADRENALECTOMY

Bilateral adrenalectomy can be carried out in one stage or in two stages at an interval of one week. In view of the poor general health of most of the patients and in view of the unpredictable degree of severity of the operation in some of the cases, most surgeons prefer a two-stage operation as this is undoubtedly less of a strain on the patient and less hazardous. In patients with disseminated malignant disease of the breast or prostate, gonadectomy and unilateral adrenalectomy is carried out at one stage and the second adrenal is removed a week later. It is admitted that a single-stage procedure can be performed with reasonable safety, and in this series the first 22 bilateral adrenalectomies were performed in one stage (Cade, 1954, 1955). Nevertheless, the additional risk warrants the two-stage operation (Figs 45–51).

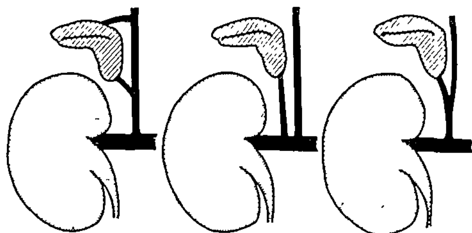


FIG 44.—Venous return from left adrenal The diagrams illustrate the common anatomical variations: two adrenal veins entering the inferior phrenic vein; a solitary adrenal vein joining the left renal vein and a junction of the left adrenal and inferior phrenic veins forming a trunk entering the renal vein

PRE-OPERATIVE TREATMENT

A careful assessment of the patient is needed and should always include a full blood count, renal function tests and aspiration of fluid from the chest in case of pleural effusion In the presence of sepsis appropriate antibiotics are given. The extent and site of metastases are ascertained and in case of skeletal metastases there is need to take extra care to avoid pathological fractures from positioning of the patient on the operating table. Pre-operative cortisone is given by intramuscular injection in 100 milligram doses, two days, one day, and one hour before the operation When a two-stage operation is contemplated, this is indicated even before the first adrenal

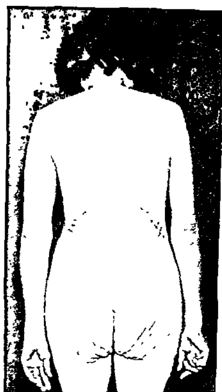


FIG. 45—Incisions used in bilateral adrenalectomy.

is removed, in case there should only be one adrenal, or wide involvement of both adrenals by metastases Blood transfusion should be given before the operation if the blood count is low Immediately before the operation an intravenous cannula is inserted and 5 per cent dextrose given slowly. Should the blood pressure fall during the operation nor-adrenaline can be added to the dextrose solution In the series at Westminster Hospital there has been no need for deoxycortone or for extra salt as a pre-operative measure, and only very exceptionally after the operation.

THE OPERATION

Anaesthesia

The very poor general condition of these patients has considerable bearing on the choice and management of the anaesthetic. Certain features are particularly important: skeletal secondary deposits, especially when the vertebral column is affected, necessitate great care in posturing the patient, and would contra-indicate the use of a spinal anaesthetic Extensive pleural effusions, even though they be aspirated pre-operatively, modify the cardio-respiratory reserve; should the pleura be opened during operation similar considerations apply. Cerebral secondary deposits may be present and cause delayed recovery from the anaesthetic.

Anaesthetic technique

General anaesthesia is used; in all patients the endotracheal route is employed Limitations of respiratory reserve, the posture during operation and the poor tolerance by these patients of anoxic episodes, all provide strong indications for this choice Doses of non-volatile anaesthetics must be kept down to a minimum; 0·5 gramme of thiopentone should not be exceeded

A light plane of general anaesthesia is maintained with nitrous oxide and oxygen together with any of a variety of supplements such as pethidine, ether or cyclopropane in low dosage. In addition, relaxants are given to provide satisfactory operating conditions; succinyl choline, gallamine, curare and decamethonium have all been used and proved satisfactory.

In patients with low respiratory reserve it is very important to ensure that partial curarization does not persist at the end of anaesthesia

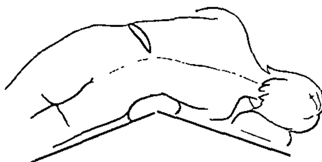


FIG 46 —Diagram illustrating the position of the patient, head and feet tilted, patient rotated laterally Incision indicated for left adrenalectomy.

Blood-pressure fluctuations during anaesthesia

The state of the peripheral circulation and the level of the arterial blood pressure are important guides to the state of the patient during anaesthesia Induction of anaesthesia and subsequent posturing may lead to hypotension, especially if large doses of thiopentone be given Manipulation of the adrenal often leads to a rise in arterial pressure, this may be considerable and reverse any induced hypotension resulting in increased bleeding at the operative site at the most inappropriate time. The rise of blood pressure can be prevented by a small dose of chlorpromazine given at the time, but whether this measure is wise remains to be seen in the light of further experience

The use of hypotensive techniques has been considered and occasionally tried, but is not practised as a routine in view of the poor state of the patient, the manifold blood-pressure fluctuations encountered, and especially the possibility of a profound fall following removal of the second adrenal

Serious hypotension is controlled by means of a nor-adrenaline drip, but with the two-stage operation profound falls in pressure are infrequent and nor-adrenaline is rarely given

Position of the patient and approach

Although transpleural approach through the diaphragm and even transperitoneal approach by laparotomy have been tried by some surgeons, the commonly used approach is posterior (Fig 45) If both adrenals are removed at one stage the patient is placed in the prone position with a pillow under the abdomen In unilateral operations the lateral position adopted for kidney operations is used; this gives the best approach and the easiest access to the adrenal. With the patient in the postero-lateral position, the head and foot of the operating table are lowered and a sandbag placed under the loin It is also an advantage to tilt the patient slightly forward The use

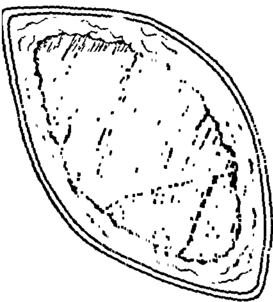


FIG 47.—Exposure of latissimus dorsi and sacro-spinalis muscles, the axis of the incision is the same as that shown in Fig 46 The dotted line indicates the incision in the sacro-spinalis

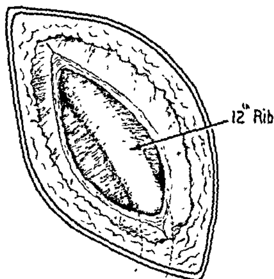


FIG. 48.—Exposure of left twelfth rib after division of muscles.

of an operating table permitting a lateral tilt as well as an easily adjustable break to lower both the head and the pelvis is of great advantage (Fig. 46). A good light is essential and a suitable head-lamp an advantage.

The incision is made over the twelfth rib, or if this is very short, over the eleventh rib. The latissimus dorsi is divided and the sacrospinalis exposed; if this muscle is broad the outer half is cut across, otherwise the lateral border of the sacrospinalis is freed and the muscle retracted medially (Fig. 47) Subperiosteal resection of the rib, either the twelfth or the eleventh, is carried out (Fig. 48). The pleural reflection crosses the rib-bed horizontally and medially in a line beginning at the origin of the twelfth rib, passing obliquely laterally and downwards (Fig. 49); the proximal part of the rib lies above the pleura and the distal half below it The line of the pleural reflection remains the same irrespective of the size of the twelfth rib If the eleventh rib is excised the rib-bed is above the pleural reflection.

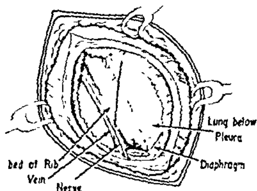


FIG. 49.—The left twelfth rib has been resected [illegible] The line of the pleural

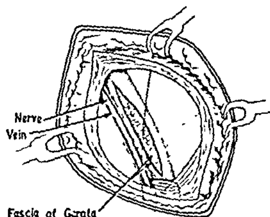


FIG. 50.—Fascia of Gerota. The two layers are shown after incision of the rib-bed. The subcostal nerve is often proximal to the vein as shown in the drawing

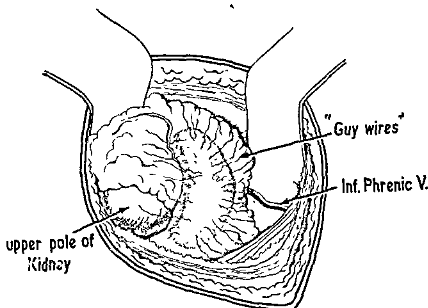
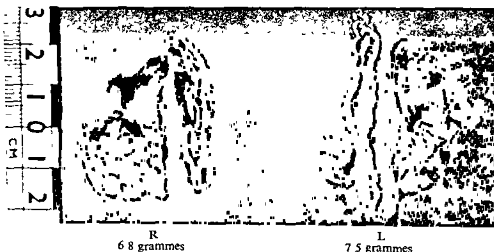


Fig 51.—Exposure of left kidney, perirenal fat and adrenal after incision of Gerota's fascia. The "guy wires" and the inferior phrenic vein are indicated

The subcostal nerve, vein and artery are identified (Fig. 49) and freed from the surrounding fibrous tissue by a few strokes of the knife and displaced distally. Injury to the subcostal nerve is followed by post-operative abdominal discomfort and pain which may last 10–14 days

The fascia of Gerota is approached through the bed of the twelfth rib above the subcostal nerve Its two layers, a thin fibrous layer and the underlying fat are easily distinguished, the division of the fascia gives access to the perirenal fat (Fig 50) and this together with the upper pole of the kidney are displaced downwards and laterally; the lower edge of the diaphragm is brought into view

The adrenal is identified by its colour, that of chamois leather, its thin edge and its *mammillated surface It varies in weight from 5 to 7 grammes to 15 or 20 grammes* The adrenal is very friable and easily torn if toothed forceps are used; when this happens there is venous bleeding from the medulla which obscures the field Usually



R
6 8 grammes

L
7 5 grammes

Fig 52.—Normal adrenals from a case of cancer of the breast.

one or two superficial veins in the *perirenal* fat above the kidney are seen running horizontally and these are a reliable guide to the *adrenal* The upper pole of the [illegible] guy wires (Fig. 51) until the gland is sufficiently free to be separated from the vena cava or the inferior phrenic vein. No main arterial vessels are seen, the numerous small arterioles are controlled by diathermy coagulation and the gland is

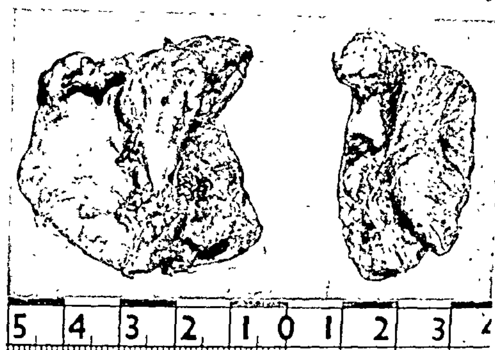


Fig. 53 —Adrenals from a case of cancer of the breast showing extensive metastases.

gradually freed from its surrounding fibrous tissue The identification of the adrenal vein is the most important step in the operation

On the right side the adrenal is rotated medially and the short vein exposed, generally near the upper pole of the gland. On the left side the adrenal is displaced laterally and the vein identified, usually the inferior phrenic vein is also seen medial to the adrenal (Figs 41 and 51). The vein is clamped with light curved forceps and tied with fine thread as near the gland as possible The adrenal is then freed from the upper pole of the kidney and removed

The adrenal may be normal (Fig. 52) or may be infiltrated with metastases (Fig 53), and these may have invaded the diaphragm, kidney or perirenal fat by direct extension In such cases the adrenal has to be excised from the surrounding tissues with the diathermy The incidence of metastases in the adrenal is very high; in this series of 100 patients it was found in 60 per cent of cases, frequently bilateral. The metastasis appears to start in the medulla and spread outwards to invade the cortex and the surrounding areolar tissue, fat, muscles (diaphragm) and kidney. The histological type of the primary growth in the breast is accurately reproduced in the adrenal, thus scirrhus, medullary and adenocarcinoma types are found The gross morbid anatomy of the metastasis varies here as in other sites, some are surrounded by a thin pseudocapsule, others are infiltrative, hard, and invade the surrounding structures

Difficulties during operation

Although adrenalectomy is usually a simple procedure, it is important to be familiar with various difficulties which may arise during the operation.

Congenital abnormalities may lead to difficulty in identifying the adrenal. It may be separate from the kidney although the kidney itself is normal, or rarely the kidney appears to be completely surrounded by peritoneum. In such cases the adrenal should be looked for on the under-surface of the diaphragm. In this situation the main veins are difficult to find and can be easily torn. Accessory adrenals may be present in the vicinity of the main gland and the operation field should always be carefully scrutinized. The accessory adrenals vary in size and may be nearly as large as the main gland Accessory adrenals are oval or round bodies, easily mistaken for enlarged lymph nodes or nerve ganglia, but for their characteristic colour.

Injury to the pleura

The pleura may sustain injury during the removal of the twelfth or eleventh rib, specially in the presence of a pleural effusion or when the tissues are oedematous, which is often the case in the presence of metastases The opening in the pleura should be carefully sutured and before the suture is finally tied the air in the pleural cavity is expelled by inflation of the lung

Haemorrhage

Excessive venous bleeding results from injury to the vena cava or inferior phrenic vein. The adrenal vein on the right side is very short and thin and when injured a lateral suture of the vena cava is needed to control the bleeding On the left side, injury or thrombosis of the renal vein may result in renal failure and death. Venous haemorrhage from the adrenal itself is always due to a tear in the cortex and medulla by toothed forceps and can be avoided by careful technique and gentle handling of the gland

Variation of the blood pressure

In some patients variation of the blood pressure during the operation may give rise to anxiety; a fall of pressure is more common but a rise in the blood pressure sometimes results from manipulation of the adrenal. The fall is corrected by the addition of nor-adrenaline to the intravenous dextrose, and the rise by suitable hypotensive drugs

Post-operative management

During the immediate post-operative period the patient should be under constant supervision and frequent blood-pressure measurements taken A fall of the pressure should be treated by nor-adrenaline but this should not be used as a routine measure. The cortisone dosage is as follows during the first post-operative day, 100 milligrams by injection every 6 hours, for the second post-operative day, 50 milligrams by injection 6 hourly, on the third to the fifth post-operative days, 25 milligrams of cortisone by mouth, 6 hourly The dose is then reduced to 75 milligrams daily and on the seventh or eighth post-operative day 50 milligrams daily is sufficient in most cases. In the [illegible]

deoxycortone nor extra salt has been found necessary

Should pulmonary infection or wound sepsis, thrombosis or embolism, or an intercurrent illness follow the operation there is, as a rule, a definite sense of malaise, lethargy, weakness, nausea, fever and tachycardia; these symptoms may precede the local signs of infection. There is also a fall of blood pressure. In such cases the dose of cortisone should be increased to 100 milligrams daily and appropriate antibiotic treatment must be begun without delay. Should vomiting prevent oral therapy, cortisone is given by intramuscular injection and in severe cases intravenous hydrocortisone is required

Delayed after-effects

Delayed after-effects following adrenalectomy may occur several weeks or even months following operation. The precipitating factors leading to disturbance of

biochemical balance may be trivial, such as a common cold or a transient epidemic gastro-enteritis or a more severe illness such as pneumonia or recrudescence of activity in the metastases, accidental overdose of barbiturates, and in a few patients the stress of x-ray therapy in an attempt to palliate residual or uncontrolled lesions. The clinical features of the delayed effects are the signs and symptoms of an incipient Addisonian crisis: nausea, vomiting, anorexia, weakness, drowsiness, dehydration, tachycardia and hypotension. These delayed effects have occurred in 11 instances in a series of 95 adrenalectomized patients. Of these, 4 suffered from repeated and protracted attacks with nausea and vomiting as the predominant features. In 2, similar symptoms were present before operation and their persistence or recurrence may primarily have been due to the underlying malignant disease.

Biochemical investigations frequently show a low serum sodium and a rise of blood urea; the serum potassium ranges about the upper normal limit. Occasionally low "true" blood sugar levels have been recorded. Urine analysis indicates excessive loss of sodium in spite of low serum sodium levels.

The treatment of the acute adrenal insufficiency varies with the severity of the case. In milder forms 50 milligrams of cortisone are given intramuscularly twice daily; chlorpromazine in 25–50 milligram doses is given to control vomiting and so permit fluids and salt in the form of sodium chloride tablets to be taken by mouth.

The severe episode calls for intravenous hydrocortisone as a life-saving measure. One-hundred milligrams are given by slow intravenous infusion in 4–6 hours. Water and electrolyte deficit, often considerable, is corrected by normal saline and M/6 sodium lactate intravenously in appropriate proportion. At the same time an intramuscular injection of 50 milligrams of cortisone is given twice daily, as the intravenous hydrocortisone is rapidly eliminated from the body.

In some patients the crisis is chiefly one of hypotension and the response to hydrocortisone less effective In such patients intravenous infusion of nor-adrenaline is needed

Maintenance therapy

Whilst cortisone alone is sufficient to maintain the majority of adrenalectomized patients in good health and to tide them over a minor crisis, compounds with greater sodium-retaining properties are occasionally required to supplement cortisone both during an emergency and for subsequent maintenance. Deoxycortone acetate, 6–9 milligrams daily in linguets, may be effective, for parenteral use the microcrystalline suspe[illegible] fortnightly, is convenient. F[illegible] by mouth has a powerful action on electrolyte metabolism but [illegible] retention and potassium depletion to a dangerous degree have been observed with its use, which therefore needs careful supervision. Hydrocortisone for intravenous use should always be available for adrenalectomized patients as it may prove a life-saving measure in a crisis

THE EFFECT OF ADRENALECTOMY ON CANCER OF THE BREAST AND PROSTATE

The conception that cancer in certain sites, namely the breast and prostate are not autonomous but dependent upon hormonal control has altered profoundly the management of patients with advanced or disseminated disease. The response to treatment by the administration of hormones has proved that regression of lesions and relief from pain is achieved in a proportion of patients and that such control of the disease lasts for periods varying from several months to a few years

Oestrogens are indicated only in the older age-group, in women 10 years or more after the menopause, and in men in cancer of the prostate but not in cancer of the breast. Androgens can be used in all age-groups in women, but are not indicated in

men. Further, androgéns produce many unpleasant side-effects, such as skin lesions (acne), alteration in voice, and growth of hair on the face. Masculinization and its undesirable side-effects in women and gynaecomastia, and nausea in men, limit the usefulness of hormonal therapy. But besides these unpleasant and often distressing side-effects, the benefit of hormones are limited often to only a few months and only exceptionally to 2 or more years.

Adrenalectomy has been suggested and tried by Huggins with the object of influencing breast and prostatic cancer by the withdrawal of all known sources of the steroids which sustain cancer in these sites It has now been shown that total ablation of the

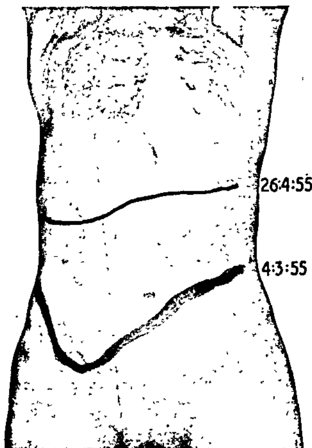


FIG 54 —Gross metastatic enlargement of liver from bilateral breast cancer, showing regression of size of liver 7 weeks after adrenalectomy

hypophysis is followed by improvement in breast and prostatic cancer similar in every way to that following adrenalectomy

The study of patients submitted to adrenalectomy and gonadectomy has led to several important observations.

Only a proportion of mammary and prostatic cancer are hormone dependent. This proportion seems to be about 60 per cent dependent to 40 per cent non-dependent. The biological property of hormone dependence cannot be correlated with any clinical or histological group of tumour, nor is it related to the stage of the disease. The fact that tumours which at first are hormone dependent subsequently cease to be so, may be due to some physiological adjustment which develops following adrenalectomy This possibility is supported by the observation that further hormonal control can be achieved by hypophysectomy in adrenalectomized patients who cease to be controlled after a period following a primary remission after the removal of the adrenals. Nevertheless a considerable proportion of tumours are not controlled

hormonally. There is so far no test to distinguish the two types of tumours from each other. Adrenalectomy and hypophysectomy are therefore still undertaken without knowledge as to their likely success or failure. The benefits of the operation in successful cases, however, are such as to warrant it in an increasing number of patients in the advanced stages of the disease and with disseminated lesions.

The operative risks are now clearly appreciated; of the 100 patients operated on, 10 died following the operation.

The operation is a palliative treatment and there is, so far, no indication that it can eradicate the disease. The length of palliation or control varies but periods of survival up to 3 years are now recorded.

The greatest benefit from adrenalectomy is relief from pain from skeletal metastasis Such relief is noticed within a few days and occasionally even within a few hours following the operation The mechanism of this control of pain is unknown

Other benefits of the operation are the temporary regression of visible and palpable lesions and at times their total disappearance. Thus cutaneous and subcutaneous nodules, enlarged lymph nodes, liver metastasis (Fig. 54), intra-ocular lesions (Fig. 55) and extensive bilateral primary breast cancer (Fig. 56) which can be seen, and gross enlargement of the prostate which can be felt, regress and disappear or diminish in size. Radiological studies have shown disappearance of multiple pulmonary metastasis, absorption of pleural effusion (Fig. 57), healing of pathological fractures and recalcification of osteolytic lesions (Figs. 58 and 59).

These effects, even though temporary and obtained only in a proportion of patients, are so striking as to suggest that more patients with disseminated breast and prostatic cancer who no longer respond to x-ray therapy or hormones should be considered for adrenalectomy or hypophysectomy unless definite contra-indications are present.

The contra-indications to date are diffuse infiltration of the lung lymphatics, involvement of the heart, massive cerebral metastases and advanced age Some patients in the younger age-group, even some who seemed in extremis, have survived the operation and derived considerable benefit from it

Relief of pain is not always followed by radiological evidence of improvement in skeletal metastases. In some patients subjective improvement with a return to normal life occurs in spite of further development of new skeletal lesions.

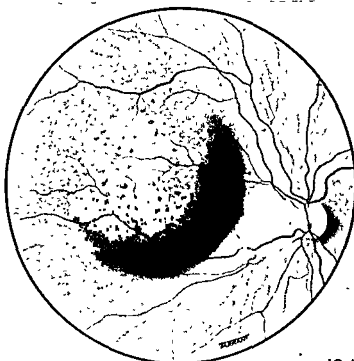
Life on cortisone is no great hardship on the patient unless extra stress occurs, such as an intercurrent illness or an accident. The risks associated with adrenal insufficiency are now better understood and the treatment of a post-adrenalectomy crisis, even though severe, is nearly always successful.

It is necessary to emphasize that adrenalectomy can only prove of benefit in hormone-dependent cancers and then only in a proportion of them; that its benefits are not permanent and that there is always a risk of an Addisonian crisis. Nevertheless, the operation has achieved more than any other form of treatment at a stage of the disease when no previously known treatment was of benefit, except morphinization or the abolition of the perception of pain by leucotomy, neither of which has ever restored a patient to a normal life.

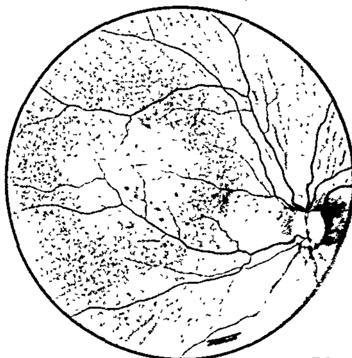
Analysis of 100 patients with cancer of the breast treated by adrenalectomy

Material

One-hundred patients (including one male) with breast cancer were submitted to adrenalectomy for disseminated disease, including visceral, skeletal and local lesions. Nearly all patients had previously received other forms of treatment—mastectomy, radiotherapy and the administration of androgens or oestrogens. The criterion for adrenalectomy was, in fact, a state where no other treatment was possible or likely to give any benefit. Selection of cases for adrenalectomy from among those considered doomed and beyond help consisted in excluding patients in whom the vital functions,



(a) 12.IC
12.10 54



(b)

FIG 55.—(a) Metastasis in retina [illegible] sion of metastasis 11 [illegible]

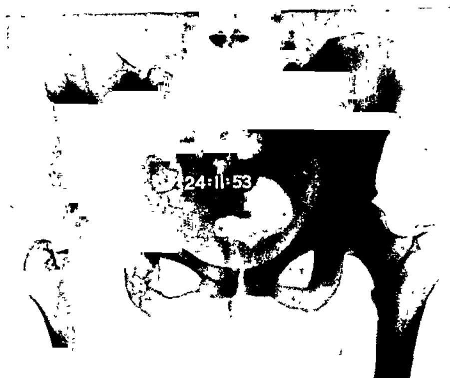


(*a*)



(*b*)

FIG. 58.—(*a*) Osteolytic metastasis in left ilium; (*b*) recalcification, 6 months after adrenalectomy. Complete relief of pain.



(a)



(b)

FIG. 59.—(a) Metastasis from breast cancer in right ischium; (b) showing recalcification 1½ years after adrenalectomy. Complete relief of pain.



FIG. 60.—Photograph of 18 patients with advanced and disseminated skeletal and visceral metastasis from breast cancer. All these patients were in the terminal stages of the disease with severe pain no longer responding to drugs and complete incapacity. All had skeletal metastasis; several pulmonary and hepatic metastasis and three had an intraocular lesion. The photograph shows the patients at varying intervals of 2 years to 6 months after adrenalectomy. All these patients returned to a normal life and needed no pain relieving drugs

cardiac and respiratory, were so grossly impaired as to render operative survival unlikely.

The advanced and disseminated stage is shown in Table I.

TABLE I

METASTASIS IN 100 PATIENTS

Skeletal	80
Pulmonary	30
Skeletal and pulmonary	60
Pleural effusion	20
Local recurrence and opposite breast	27
Widespread disease (previously untreated)	8
Intra-ocular metastasis	4
Liver metastasis	12
Multiple metastasis (visceral, skeletal, local)	17

The age of the patients varied from 29 to 65 years The age by itself was not found to be a contra-indication to the operation and the older age-group showed as great a proportion of favourable results as the younger age-group The effect of the operation was assessed on two bases: (1) subjective; and (2) objective. Subjective improvement



FIG. 61. Metastases [illegible]

was judged by: (*a*) relief of pain; (*b*) ambulation following a bedridden state; and (*c*) increase in sense of well being, appetite, interest in life, capability of return to work. Objective improvement was judged by: (*a*) disappearance of visible lesions, local condition of breast, regression of nodules and recurrences in mastectomy scar, disappearance of intra-ocular lesions; (*b*) diminution in the size of the liver, or gross tumours in the abdominal wall or pelvis; and (*c*) recalcification of skeletal osteolytic lesions, healing of pathological fractures, and alterations in radiological appearances of skeletal metastasis.



FIG 62.—Multiple metastases in the skull, same patient as in Fig 61.

Statistical assessment of the effects of adrenalectomy are shown in Tables II and III. In addition there is the assessment of return of function, relief of pain, restoration of a sense of well being and return to a normal existence which it is difficult, if not impossible, to translate into a statistical analysis (Fig. 60). Every patient was asked at the end of the third post-operative month if she considered the operation a success, worthwhile, and why? The successful cases had no hesitation in stating: (*i*) relief of pain; (*ii*) return to usual work or household activity; (*iii*) no need for medicines.

In the case illustrated in Figs 61 and 62 with pathological fractures of both humeri, multiple skeletal metastases in the skull, all the vertebrae, the pelvis, the femora and gross enlargement of the liver well below the umbilicus, the patient who had been bedridden and an invalid for many months, reported in a letter 3 months after adrenalectomy as follows

"My doctor and all my friends were amazed to see the marvellous change in me. It was difficult for them to realize I was the same woman who had gone so helpless to

London. I am able to walk quite a distance, my weight has increased from 7 stone to 8 stone 4 pounds. My appetite is good; I sleep well. My arms are as good as new. I am managing splendidly on 2 cortisone tablets daily."

The results are shown in Table II.

TABLE II

EFFECT OF ADRENALECTOMY IN DISSEMINATED BREAST CANCER (PER CENT)

	Excellent	*Good*	*No effect*
Subjective	30	30	40 (including 10 operative deaths)
Objective	10	20	70 (including 10 operative deaths)

The effect on various sites of metastases is shown in Table III.

TABLE III

OBJECTIVE EFFECT OF ADRENALECTOMY ON METASTASES (PER CENT)

	Excellent	*Good*	*No effect*
Skeletal	15	20	65
Pulmonary	10	10	80
Pleural	10	10	80
Intra-ocular	75	—	25
Local recurrence	15	35	50

Duration of improvement

In this series of 100 patients the longest period of survival has been 2½ years. In most patients a period of control of the disease lasting for 1–2 years is followed by recrudescence of the disease, further skeletal metastatic spread, anaemia and death from the effects of the disease. During the period of regression the benefits of the adrenalectomy are relief of pain, return to normal activities and enjoyment of life.

SUMMARY AND CONCLUSION

In the hormone-dependent cancers of the breast, adrenalectomy and gonadectomy results in a temporary control of the disease which cannot be achieved by any other means except hypophysectomy. Life on cortisone is no different from normal life and compares well with life on insulin. The operative risk is relatively small, about 10 per cent in the first 100 cases, and will no doubt diminish with further experience.

The choice between adrenalectomy and hypophysectomy is at present still indefinite and much greater experience of each procedure is needed before a considered opinion can be given The value of adrenalectomy in disseminated and terminal stages of breast cancer is greater than any known method of treatment in disseminated cancer in other sites.

(*See also British Surgical Practice:* Adrenal Glands, Vol. I, page 94, S. Key 12.)

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MECHANISM

Longitudinal or vertical compression forces will produce various fractures of the head or body of the talus. Compression fractures of the whole talus are extremely rare, except as part of a severe comminution involving the tibia and calcaneum as well (Fig. 64). The [illegible] strains and amoun[illegible] Dorsiflexion (exte[illegible] or plantar flexion (flexion) are responsible for the more important injuries and further displacement is brought about by inward or outward rotation of the foot.



Fig. 64.—Combined comminuted fractures of the talus and calcaneum.

A fall from a height usually produces a compression fracture of the calcaneum, but Baudet (1914) observed that a fracture of the neck of the talus could be produced in this way if the sole of the boot is flexible and the victim lands so that the foot is forcibly extended at the ankle. He pointed out that it is the forcible impact of the margin of the tibia on the neck of the talus which produces what is in effect a crush fracture (Fig. 65). A continuing dorsiflexion strain causes the calcaneum to dislocate forwards and upwards with the separated head of the talus, the posterior talofibular ligament ruptures if the force is continued, and the body of the talus is dislocated backwards out of the mortice of the ankle, during its backward movement it is rotated by impaction against the tendon of the flexor longus hallucis, and displaced by inversion or eversion strain on the foot Eventually the body of the talus comes to lie behind the ankle transversely to its normal axis, and usually with the fractured anterior surface facing outwards. It is probable that forcible plantar flexion (Fig. 65) and rotation of the foot is the cause of total dislocation of the unfractured talus Plantar flexion is so extreme that complete forward dislocation of the whole foot at the ankle first occurs. The foot is then forcibly adducted and inverted so that the talus becomes rotated on its vertical and longitudinal axes: the foot itself then recoils

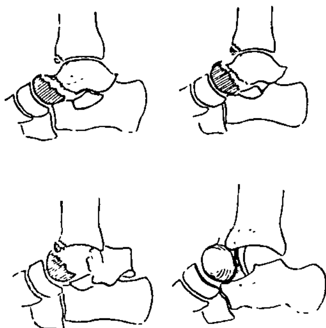


FIG. 65 —Diagrams showing the three types of injury produced by dorsiflexion and (bottom right) total dislocation, which is a plantar flexion injury.

below the tibia but the talus is left displaced in its rotated position outside and in front of the ankle, on the dorsum of the foot

Although rare in ordinary practice, these severe injuries of the talus are frequently met with in the survivors of aircraft accidents, in which the foot is so often violently wrenched while the victim remains in a seated position (Anderson, 1919, Coltart, 1952). Because of the violence, fracture-dislocations and total dislocations of the talus are often compound injuries, and in many cases the body of the talus or the whole bone is completely avulsed and lost through the wound (Fig. 66). The severe wounds often become septic, and loss of the whole or part of the talus as a sequestrum is a frequent aftermath Another all too frequent reason for sequestration and loss of the bone is sloughing of the overlying skin in cases where the displacement has not been recognized and reduction has been delayed

CLINICAL FEATURES AND TREATMENT

When the case is seen early enough it will be possible to feel the displaced body of the talus, behind and usually to the inner side of the ankle, or the whole talus, in its displaced position, on the dorsum of the foot, in front of the ankle. In cases of fracture without dislocation and in all cases where gross swelling obscures the displacement, differential diagnosis from other injuries, such as Pott's fracture or fracture of the calcaneum, can only be made after radiological examination, unless of course there is a wound through which the talus is visible.

Fractures

Chip and avulsion fractures and compression fracture of the head

These do not require special knowledge and are treated conservatively, in plaster, although occasionally a large rotated fragment may require operative removal



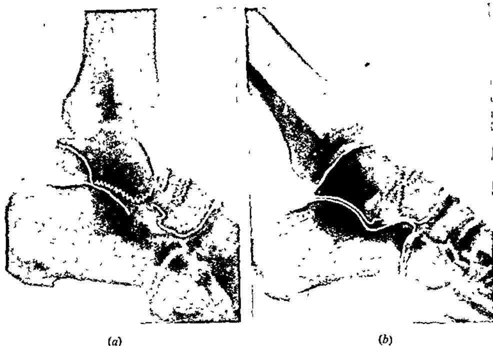
FIG 66.—Compound fracture-dislocation of the whole talus

Fractures of the body

These are of three types· (1) crush fractures, which are rare; (2) vertical fractures, which do not require special treatment unless complicated by sub-astragaloid tarsal dislocation (*see under* Fracture-dislocations); and (3) the unusual "dome fracture" in which a fragment of the superior articular surface becomes detached and inverted, and is therefore best removed by operation (Fig 67) (Coltart, 1952; Nisbet, 1954).

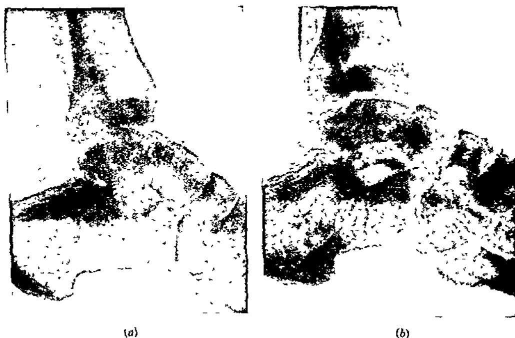


FIG. 67.—"Dome fracture" of the body of the talus.



(a) (b)

Fig. 68.—Radiographs before and after reduction of a fracture of the neck of the talus with subtalar dislocation



(a) (b)

Fig 69.—Radiographs showing recurrence of deformity when the foot was brought up to a right-angle four weeks after perfect reduction of a fracture-dislocation of the neck of the talus.

Fractures of the neck

As often as not fractures of the neck are complicated by sub-astragaloid dislocation. Very careful examination of a lateral radiograph is required. If there is any upward displacement of the head of the talus on the body, there is certain to be a subluxation which must be reduced. Simple fractures without displacement will unite readily in about eight weeks. It is best to avoid weight-bearing in plaster for the first four weeks

Fracture-dislocations

Fracture-dislocation of neck or body

Vertical fractures of the neck or body of the talus occur as the result of violent dorsiflexion; continuation of this force results in forward and upward dislocation at the sub-astragaloid joint, while the proximal portion of the talus drops into a plantar flexed position (Fig 68). Reduction is effected by plantar flexion of the foot, with inversion or eversion as required to correct any additional displacement. The manipulation should be carried out under radiological control if possible. It is necessary to keep the foot well plantar flexed, in plaster. Union will take at least eight weeks, and if the plaster has to be changed during this time careful check radiographs must be taken to guard against redisplacement (Fig. 69).

Fig 68 makes the displacement appear very obvious and easy to diagnose, but this is by no means always the case, and, as has already been pointed out, any displacement of the distal fragment in a fracture of the neck or body of the talus suggests that there is a subluxation of the talo-calcaneal joint which must be corrected by plantar flexion. Although perfect reduction of the sub-talar displacement is essential, a good result does not always follow and painful traumatic arthritis is as common after these injuries as after calcaneal fractures. Aseptic necrosis occurs frequently after this type of injury, about 90 per cent are thus affected when the fracture runs through the body and 30 per cent with the more distal fracture through the neck.

Fracture of the neck with posterior dislocation of the body

The mechanism of this interesting injury has already been described Figs. 70 and 71 show examples, although radiographs do not show the skin stretched tightly over the body of the talus, which is such a dangerous feature of this injury.

Operation reveals that all the ligamentous and capsular attachments of the dislocated bone are torn off except those of the medial (deltoid) ligament, which may often be preserved. Injuries to the vessels, nerves and tendons at the inner side of the ankle are unusual despite the gross violence of the accident and the degree of displacement. This is probably because the body rotates away from them and, when it finally becomes displaced medially, remains behind the tendon of the flexor hallucis longus which protects the neurovascular bundle.

More often than not this severe injury is compound and the body of the talus is avulsed and lost or has perforce to be removed because of gross comminution or soiling. It is sometimes possible to reduce the displacement by *manipulation*. The [illegible] and [illegible]

pushed back into its place. An ingenious method of reduction was used by [illegible] (1944), who exerted traction through the heel by means of a Kirschner wire and then manipulated the body of the talus into place after having transfixed it by a Steinmann's pin (Fig. 72 *a*, *b* and *c*)

In closed injuries it is most important to relieve the pressure that the displaced talus exerts on the tightly stretched skin at the medial side of the foot. There should be no delay in resorting to operation if manipulation has failed to reduce the displacement

Open reduction —The bone is exposed through a curved incision directly over it, where it lies usually below and behind the medial malleolus. The neurovascular



FIG. 70.—Fracture of the neck of the talus with posterior dislocation of the body, and rotation.



FIG. 71.—Incomplete backward dislocation of the body of the talus.



(a)



(b)



(c)

FIG. 72.—Fracture-dislocation of talus before reduction. The displacement was reduced by manipulation after transfixion of the body of the talus with a Steinmann's pin (Mr. J. R. Armstrong's case).

bundle and tendons are retracted out of danger, the ankle joint is widened by traction on the heel, and the talus rotated and manoeuvred into the ankle joint. Reduction is stable Plaster is applied with the foot in a plantar-flexed position in order to restore the alignment of the head and body of the talus.

When ordinary manipulation has failed but operative reduction is contra-indicated because of lack of facilities or because of the poor condition of the patient, it is important to relieve the dangerous pressure on the skin over the displaced bone. In this event, the talus should be pushed into the soft tissue in the midline between the back of the ankle joint and the tendo-calcaneus; there is plenty of room for it there and the tension on the skin will be relieved until operative reduction is feasible.



FIG 73.—Total dislocation of the talus.

In this injury and in total dislocation, to be described next, aseptic necrosis is an almost invariable complication, but in the majority of cases the fracture of the neck will unite and sufficient regeneration will occur to prevent fragmentation and collapse of the talus. Radiological evidence of avascular necrosis in this and other types of injury will appear within six weeks of the injury if it is going to occur at all, and regeneration will take between sixteen and twenty-four weeks. After six months, no further improvement is to be expected.

Total dislocation of the talus

In this injury the talus is dislocated from all three joints of which it forms a part. The characteristic feature is that displacement is forwards and laterally so that the bone comes to rest under the skin in front of the ankle on the dorso-lateral aspect of the foot. There is often complete avulsion of the talus, but the wound through which the extrusic [illegible] the ankle and to the [illegible] talus has been disloc [illegible] malleolus and is rotated through 90 degrees in both its vertical and longitudinal axes, with the head pointing medially and the under-surface backwards. Probably this represents the greatest displacement, and rotation may not always be so complete in both directions. Occasionally the bone may be broken through its neck, but the injury is

distinguished from other fracture-dislocations by displacement forwards instead of backwards (Fig. 66)

The majority of injuries are compound, but if not, *relief of tension on the skin is just as urgent*; here the talus cannot be displaced into some loose soft tissue area, and so must be reduced or removed at once if sloughing and infection are to be avoided. Manipulative reduction must be extremely difficult. Bonnin has reported a case in which the completely dislocated whole talus was reduced by operation, with good result (Bonnin, 1940)

Astragalectomy and arthrodesis

Some authors have recommended excision of the talus as the method of choice in the treatment of total dislocation or fracture-dislocation of the talus. There are cases



Fig. 74.—*Two examples of tibio-calcaneal fusion after removal of the talus. The fusion is completed by fixing the fibular malleolus or a tibial graft to the lateral wall of the calcaneum*

in which there is no choice, for the talus may be extruded and lost; it may be essential to remove a grossly damaged and soiled bone as part of the surgical treatment of a wound, or the talus may sequestrate in an infected compourd injury, either primarily compound or when there has been necrosis of the skin over the displaced bone. However, in many cases the talus can be preserved with reasonable safety, provided some shred of soft tissue remains attached suggesting a possible blood supply—and often the attachments of the medial ligament do in fact remain. Most recent opinions on the subject agree that excision of the talus fails in the treatment of fractures and dislocations. Good results have been reported, but it seems quite probable that the results refer only to function and not to mobility so that there may have been ankylosis between the tibia and calcaneum

Some observations (Coltart, 1952) suggest that a painful foot always results after loss of the talus unless the tibia becomes firmly ankylosed to the calcaneum, and that early operative fusion of the tibia to the foot is, therefore, a sound surgical procedure (Fig. 74)

Astragalectomy is not advisable for painful secondary arthritis of the ankle and

talo-calcaneal joints when a crushed or avascular bone remains *in situ* In those cases the body of the talus is preserved and used in surgical fusion of the tibia to the calcaneum (Fig. 75)

Tibio-calcaneal or tibio-talo-calcaneal fusion

Both operations are performed through a lateral incision. The shaft of the fibula is divided about three inches above the ankle and the distal fragment removed, to provide easy access to the space between the tibia and the calcaneum, if the talus has been lost or removed, or to the ankle and talo-calcaneal joints when the bone remains



FIG. 75.—Tibio-talo-calcaneal fusion The talus is retained in position and fusion is completed with the aid of a tibial graft and iliac chips

in place All articular cartilage is removed, and cancellous bone from the iliac crest used to pack the space and build up the height of the foot when the talus is absent or severely crushed Fusion is completed by re-applying the fibula, shaped and denuded of articular cartilage, to prepared areas on the side of the tibia and calcaneum If the fibula is not in good condition it is an easy matter to take a length of cortical bone from the tibia in either case the graft should be fixed securely to the tibia and the calcaneum by screws (Figs. 74 and 75) A firm arthrodesis is unlikely in less than sixteen weeks, and a walking heel should not be applied until eight weeks after operation

It is surprising to know that the foot can be restored to useful function after complete obliteration of both ankle and subtalar joints.

ACKNOWLEDGEMENTS

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(*See also British Surgical Practice* Fractures, Dislocations, Fracture-Dislocations and Allied Injuries, Vol. 4, page 165, S Key 157.)

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THE INTERINNOMINO-ABDOMINAL AMPUTATION

(INTERILIO-ABDOMINAL OR HINDQUARTER AMPUTATION)

By SIR GORDON GORDON-TAYLOR, K B.E., C.B , M.A , F.R.C.S.

CONSULTING SURGEON TO MIDDLESEX HOSPITAL, AND THE ROYAL NAVY

ἀλλ' οἷ γὰε ἀθυμοῦντες ἄνδρες οὔποτε τρόπαιον ἐστήσαντο

The term *interilio-abdominal* or *interinnomino-abdominal* amputation would seem the most appropriate appellation for the operation: the former name at least possesses the advantage of being a syllable shorter and also enjoys the blessing of that master of language, René Leriche. *Interpelvi-abdominal* amputation, the title employed by Hogarth Pringle (1916), is more suggestive of some spectacular feat of expert swordsmanship in an equestrian arena and would seem to betoken an even more stupendous and inevitably murderous assault than that which on occasion is demanded of surgical operators bent on doing their very utmost to cheat the cancer foe of its victim.

Despite transatlantic gibes at my squeamishness over the hybrid *hemipelvectomy* the name grates on my ear like the screeching of the brakes on the reckless driver's automobile, or the citharoedus or harp player in Horace's *Ars Poetica* "who for ever wounds the ear with the same discord": moreover, the hybrid word exaggerates the extent of the dismemberment. Nevertheless, American writers favour this usage: British authors exhibit a preference for the designation *hindquarter amputation*, a term which, though a trifle vulgar, does indicate with some accuracy the extent of the human immolation

In 1935, Philip Wiles and I endeavoured to collect all the cases of the operation reported in the literature: at that time the amputation had been performed only 79 times, with 46 deaths, that is, a recovery rate of 48 5 per cent In 1946, along with D H Patey, I was able to add from my own experience and from the literature an additional 73 cases, with a recovery rate which had by this time advanced to 71 per cent

In the last decade, experience, anaesthesia and a greater knowledge of the physiological processes engendered in the response to injury have reduced the mortality to an infinitesimally small percentage, and in the last 30 or more cases of my own there has been no fatality

Alas! the hopes entertained and expressed in 1935 that this great mutilation would be less and less frequently performed have scarcely been fulfilled: at that time Philip Wiles and I wrote:

" Radiation therapy at the moment seems to be displacing the more crude and maiming methods of ablating cancer, but even with the growing perfection of methods of radiation the treatment of certain forms of sarcoma may perhaps still occasionally demand this amputation, and so long as procrastination remains a characteristic human trait where disease is concerned, and while tumours are allowed to attain colossal and crippling proportions, only this type of procedure will rid the patient of his encumbrance, his pain and his load of malignancy."

Unfortunately, instead of the relegation of the amputation to the limbo, the occasions on which the operation is performed appear to increase in frequency.

The hindquarter amputation has found inclusion in the category of surgical operations ever since Billroth, that pioneer of so many surgical enterprises, first employed it 64 years ago in 1891, although it was left to the Frenchman Girard to secure the first success four years later in 1895. It is no less than 44 years ago (1911) that I first contemplated the performance of this operation for a male patient sixty odd years of age with a sarcoma of the upper end of the femur, staging the procedure in two *séances*: methods of resuscitation were fantastically deficient in those far-distant days, and although the patient temporarily left the hospital after a high amputation of the thigh he died of an intercurrent infection before his re-admission for the second more proximal operation envisaged World War I was to intervene before my next opportunity for a hindquarter amputation presented itself in 1922.

The experience and the views expressed in this communication are based on 92 cases of this amputation performed by Middlesex Hospital surgeons; but I hasten to add that none of the operations terminating fatally have belonged to my colleagues: the burden of fatality rests on my shoulders alone. Perhaps this very considerable series of the amputations is not unrelated to the lengthy cancer-tradition associated with Middlesex Hospital, where special wards for the treatment of cancer were instituted in the closing years of the eighteenth century. On the other hand, the writer's personal tally of 84 hindquarter amputations is almost equalled by the number of years of his long life

INDICATIONS FOR THE HINDQUARTER AMPUTATION

(1) The hindquarter amputation has been employed by me for *primary malignant neoplasms of the bones abutting* on the hip joint which, if radical extirpation of the malady be still seemingly possible after the repeated courses of radiotherapy that pious hope continues to dictate, demand a more proximal amputation than the more mundane removal of the lower extremity at the hip.

Up to the present date the hindquarter amputation has never been employed by me for secondary tumours, such as a metastasis of hypernephroma in the innominate bone, although such a procedure may be justified by the well-known tendency of hypernephroma to metastasize to a single bone and to progress slowly even from that stage.

(2) The hindquarter amputation has also been employed by us in the cases of certain *sarcomata of muscles and connective tissue spaces at the root of the limb* (Plate I) especially where by reason of size, particular anatomical situation, attachment to innominate bone or uppermost femur, recurrence or radio-resistance, a really complete and radical removal is not possible without the sacrifice of a segment of the pelvic girdle and the whole lower extremity (Figs 76, 77 and 78)

The practicability of the amputation is naturally influenced by such conditions as the general physical state of the patient, the extent of the tumour, and also not slightly by his or her mentality The patient with an absence of cerebral grey matter may conceivably recover from a hindquarter amputation, but a deficiency of intelligence, or mental hebetude is the harbinger of an unsuccessful result.

The influence of age is not so weighty; the amputation has been successfully performed on patients between the ages of 11 years (an undifferentiated sarcoma of the adductor muscles invading the os pubis) and 12 years (a rapidly growing sarcoma of the gluteus medius and minimus, who remains free from recurrence 4 years later) and at the other end of the scale the ages of 69, 70 and 71 years [illegible] especially [illegible] ry in [illegible] on two occasions.

PLATE I



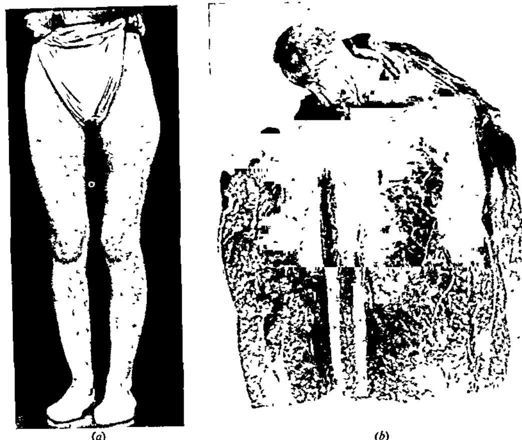
Spindle cell sarcoma of the muscles of the adductor region of the left thigh, just below Poupart's ligament, measuring 4 × 5 inches and displacing the femoral artery Hindquarter amputation 20th July, 1954



FIG 77.—Helen J. hindquarter amputation performed for a large rapidly-growing tumour of the soft tissues largely placed on the posterior aspect of the thigh. The diagnosis was finally a *malignant synovioma*. Death took place 4 or 5 months later from thoracic and cerebral metastases.

TECHNIQUE

Although the opinion of a skilled radio-diagnostician, especially one versed in bone pathology, is of inestimable value, *every hindquarter amputation should be preceded by a biopsy.*



(a) (b)

FIG. 78 —(a) Sarcoma arising in tendinous insertion of glutei into the trochanteric region of the left femur Operation July 1947. Patient still in good health more than eight years later (b) Same case (E F) showing pathological fracture of the femur.

The technique of the hindquarter amputation has been described and illustrated in a number of papers in the past 20 years. Already the reproach of the reader is to be heard ringing in the writer's ears: *Cantilenam eandem canis**, and then as an afterthought those lines from Lucretius.

iuvat integros accedere fontes
Atque haurire, iuvatque novos decerpere flores†

However, attention will only be directed now to such modifications in technique as have been found valuable in facilitating the conduct of the operation and promoting its safety

It has often seemed to me somewhat of a paradox that the surgical swansong of one who formerly prided himself on his artistry should in the autumn of his life have been intimately concerned with a sacrifice which has evoked from French reviewers such epithets as *effroyable et épouvantable*; the hindquarter amputation is of course a simple surgical exercise, well suited for an elderly surgeon possessed of a modicum of anatomy and the ability to stand by an operating table for a mere 50–60 minutes on end

Recovery from such a mutilation is possible even when injury in its crudest form performs a traumatic hindquarter amputation, with a ferocity akin to that displayed towards the testicles by Father Origan and his imitators in self-castration.

*You keep singing the same old song.
†It is nice to have a fresh drink and to gather new flowers.

Case I: A lighterman was working close inshore with one lower limb on the edge of a boat, the other on a raft A wire hawser got wound round one of his limbs, and a wave carrying one craft upwards and the other down, a hideous traumatic hindquarter was performed, the amputated limb remaining on the deck entangled in the hawser, the head, trunk and second limb being precipitated, head downwards, into the water. The bladder was torn off the posterior urethra, and the rectum was severely lacerated

The accident fortunately took place by the quayside on one of the islands off New Guinea, where an American Hospital was situated close at hand Forced transfusion was promptly employed, suprapubic drainage was instituted and a colostomy performed. I saw the victim several times during his convalescence in Concord Repatriation Hospital, Sydney, N.S W., when he was an ambulant case, and I was distressed to hear subsequently that he had succumbed from a minor surgical procedure many months after the initial injury

For some years we have practised elective ligature of the common iliac vessels. The common iliac vein is ligated with greater ease and safety after the *ilio-lumbar vein or veins* have been first divided between ligatures, the common iliac vein is thus no longer tied down posteriorly, and the aneurysm needle or distal end of a cholecystectomy forceps can be slipped behind and round the vessel with greater ease and safety. The division of the psoas muscle at the pelvic brim before steps are taken to deal with the common iliac vein will be found a further measure of safety and convenience.

Nothing engenders such mental irritation in the operator or arouses such impatience on the part of the bystander as maladroit efforts to divide the symphysis pubis. The position of the joint can almost invariably be accurately determined in the midline on the posterior surface of the anterior arch of the pelvic girdle by a vertical ridge which we term *Monro's ridge* The symphysis can often be completely divided with a stout scalpel, although a chisel may be required to complete the inferior part of the section in older patients.

Division of the symphysis should always be completed before any attempt is made to divide the posterior segment of the pelvic girdle. In the course of the posterior section, even when carried out by means of a Gigli saw, some laceration of the superior gluteal veins seems almost inevitable, and although the iliac vessels have already been ligated fairly brisk bleeding may take place. If the symphysis pubis has already been divided, the whole pelvis can usually be opened out like an oyster shell as soon as ever the posterior bone section is completed; the haemorrhage is then readily controlled by simple pressure on the swabs placed over the pelvic viscera; no further haemostatic steps are necessary until the limb has been completely removed from the body. On the other hand, if the pelvis cannot be opened out oysterwise in the manner described because of ill-advised postponement of division of the symphysis, the haemorrhage associated with the posterior section of the pelvic girdle is difficult to control and a considerable amount of blood may be lost before the symphysis can be divided and separated

Perhaps the most important improvement in the technique of the operation has concerned the division of the posterior segment of the pelvic girdle. The operative mortality for sacro-iliac disarticulation throughout the thirty odd years of our Middlesex series has not conspicuously differed from that associated with iliac section, but mortality figures alone do not reflect a true comparison of the severity of the two procedures, and sacro-iliac disarticulation is unquestionably the more difficult and anxious operation.

For section of the posterior segment of the pelvic girdle no instrument is more [illegible] Gigli saw other forms of saw cannot be conveniently [illegible] slip and may cause disastrous damage to the adjacent [illegible] the Gigli saw can be introduced satisfactorily even in cases where exuberant new growth overhangs and obscures the sacro-iliac

synchondrosis anteriorly, and can even be coaxed to cut through the ala of the sacrum with safety.

Occasionally the upward spread of a massive neoplasm such as a chondrosarcoma of the ilium has obliterated the whole space between the ribs and the iliac crest Sacro-iliac section can still be achieved, but instead of the iliac crest and ilio-lumbar angle being cleared superiorly as a preliminary to the saw-cut, a modified Steinmann pin is thrust from before backwards through the interspace between the fourth and fifth lumbar transverse processes; the upper extremity of the Gigli saw is attracted to the butt end of the pin and is drawn through to the back, so that the saw is made to lie across the front of the sacro-iliac joint, its two ends projecting posteriorly ready for use.

Anaesthesia

Nothing has emerged to dampen the writer's enthusiasm for spinal anaesthesia in addition to thiopentone, gas and oxygen. The spinal anaesthesia blocks the effects of section of major nerves of the affected limb and the inevitably carnivorous traction on the limb and half the pelvis which immediately precedes their final severance from the body A recent most happy operative experience of induced hypotension by means of subarachnoid sympathetic block in the skilful hands of Dr. John Gillies, C V.O , has convinced me of the advantages of this type of anaesthesia

Artificial limb

The use which patients make of their artificial limb varies immensely; some of those who have survived amputation for periods of 21–26 years are content to continue with their crutch, with which they are very skilful Some manage the artificial limb well, youth may be almost acrobatic with it. Women, though the more anxious for an artificial limb, are the more ready to discard it, although one lady even kneels in church with the prosthesis on. One male patient can walk backwards with his artificial limb, another can walk over a mile at a rate of about 2 miles per hour (Fig 79*a*, *b* and *c*), some have had the good fortune to possess cars and drive wearing their prostheses

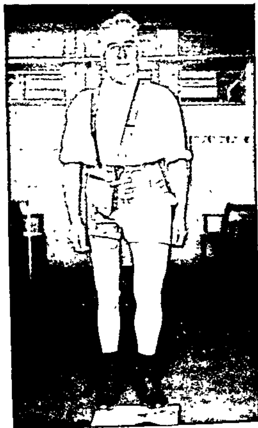
PROGNOSIS

Chondrosarcoma

Other than those cases in which operation is precluded (Fig. 80), an analysis of the cases submitted to hindquarter amputation shows that the best end-results are obtained with the chondrosarcomata, 70 per cent remaining free from recurrence (Fig 81) On the other hand, incomplete removal brings its nemesis of local recurrence or distant metastases, although the appearance of the latter may be delayed as long as five years

The osteoblastic or osteogenic sarcomas

These cases have given disappointing results. not only has the operative mortality proved higher in this group, but the end-results have been poor. Investigation of the case-histories, including re-inspection and scrutiny of the pathological material and of the illustrations depicting the various osteogenic tumours removed shows that in almost every case the primary tumour was already extensive at the time of the operation, that there was almost invariably a history of many months, even a year; and that in some cases valuable time had been frittered away on radiotherapy A note of surgical encouragement was sometimes to be obtained from cases unfortunately fatal at operation, where no evidence of metastases was to be found in the body at autopsy despite the size of the tumour, even the presence of a pathological fracture and the humiliating length of the pre-operative history The writer is encouraged to believe



(a)



(b)



(c)

FIG. 79 (a), (b) and (c).—George M walking prosthesis admirably fitted at the Leeds Limb-Fitting Centre. Hindquarter amputation for chondrosarcoma of the innominate bone—June 1952. Patient in excellent health more than 3 years after.

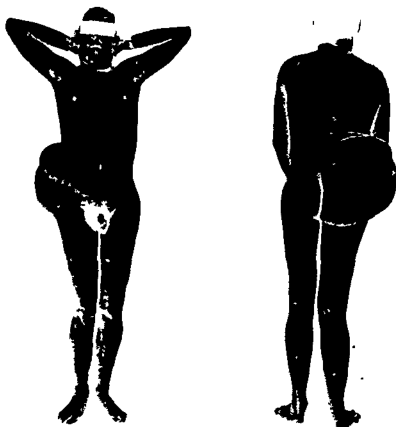


FIG. 80—Enormous chondrosarcoma of the right innominate bone The spread of the tumour towards the midline precluded any operative removal.

that an earlier meeting between surgeon and patient might produce more satisfactory results Nevertheless the prognosis remains unpredictable.

Case II: Nearly 12 years have elapsed since the wife of a naval rating was seen with an osteoblastic sarcoma of the uppermost part of the femur, which had not only involved the innominate bone by extension, but had also undergone a pathological fracture: the woman was submitted to a hindquarter amputation. A seven months pregnancy had to be terminated before the amputation was performed

The patient developed a "staghorn" renal calculus a few years ago; the stone was removed but its re-formation necessitated nephrectomy. Today the patient is in excellent health

Case III: Another survivor with an osteoblastic sarcoma had a tumour which involved the neck and upper part of the femur. She had undergone several courses of x-ray therapy, but extensive necrosis of the tissues, a stinking ulcer, disabling pain and incertitude as to the persistence of malignant elements compelled the performance of a hindquarter amputation. Examination of the specimen revealed extensive necrosis and fibrosis of the tissues, though no malignant cells were discernible in the particular sections examined.

The operation was followed by an immediate improvement in the patient's health, by the loss of pain from which she had suffered in the prolonged pre-operative period, and by a complete relief of mental unrest and anxiety.

Some of the *malignant tumours of muscle* adjacent to the hip bone, for example ilio-psoas, gluteus medius, or adductors, despite their size, have given encouraging

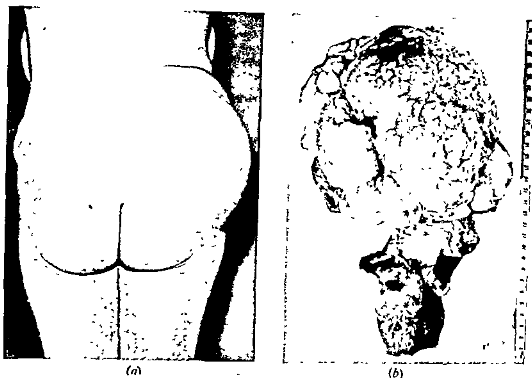


FIG. 81 —(a) Large chondrosarcoma of the right innominate bone. The lateral, as opposed to the median, extension of the tumour permitted amputation (b) Same case. Amputation. Patient free from recurrence 4 years later

results, and also several patients with malignant disease originating in the attachments of tendon to bone (extraperiosteal sarcoma). One eminently satisfactory case of this nature was that of a girl upon whom I operated in the Sydney Hospital in 1947 for a *huge extraperiosteal sarcoma producing a pathological fracture through the trochanteric region of the femur.* The girl (E. F.) survives today more than 8 years since her hindquarter amputation (Fig 78).

For the most part amputations undertaken for *sarcoma* in connexion with *Paget's disease* of the hip bone or femur, for *malignant synovioma,* for *Ewing's tumour* of the innominate bone, and one case of a *haemangiosarcoma* of the hip have done badly. One patient who underwent a hindquarter amputation for a Paget's sarcoma of the innominate bone is alive 9 months after operation (Fig. 82).

Malignant osteoclastoma of the hip bone

Two cases which, on account of their magnitude or histological character, were deemed unsuitable for radiotherapy have done well, one being alive and well 26 years after amputation.

Sarcomata of the soft tissues

In the case of *sarcoma of muscle* in the vicinity of the hip-joint, 33 per cent of the cases submitted to hindquarter amputation were alive even for long periods of years The prognosis in these cases, as in the *sarcomata of the connective tissues and intermuscular spaces* must obviously be governed by the histological picture; but even so, the prognosis remains unpredictable and patients have survived amputation upwards of 20 years (1) and over 60 per cent are still alive.



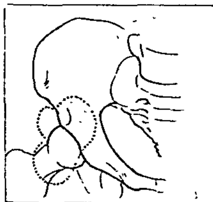


Fig. 82.—Sarcoma of the innominate bone arising in a bone already the site of Paget's disease. Operation Jan. 1955.

For intrapelvic extension of malignant disease of skin and vulva

Case IV [illegible]
a bilateral cl [illegible]
and prolong [illegible]
lower limb developed. Transperitoneal exploration by a gynaecological surgeon revealed the presence of large, firm glands along the iliac vessels on the side of the elephantine limb; there was *no* evidence of malignancy in the coelom. A hindquarter amputation rid the patient of her malignant iliac glands and the encumbrance of her mammoth lower limb. She has survived 7 years.

On three occasions a hindquarter amputation has been performed for the invasion of iliac glands by *malignant melanoma* following a primary tumour in the buttock or for a recurrent melanotic mass in the vicinity of Poupart's ligament. The patient with the melanotic iliac glands has survived her amputation more than 3 years; of the others one is alive 2 years later; the other died over a year after amputation.

Years ago Guthrie termed amputation "the opprobrium of surgery"; and Fergusson in 1867 said of amputation " one of *the meanest, and yet one of the* greatest operations in surgery; mean when resorted to when better may be done; great as the only step to give comfort and prolong life."

I still cherish the hope of a golden era of cancer therapy, when gross mechanical destruction of disease and cruel mutilation of tissue shall be no more. These times are not yet, but personal experience affords us this encouragement: that of the cases of malignant disease in the vicinity of the hip submitted to hindquarter amputation *over* 40 *per cent are above ground today*. On the other hand, the problem of the operative mortality of the amputation having now been eliminated, we may well reflect on those words of René Leriche:

> " Cependant, il faut bien l'avouer, c'est une piètre thérapeutique que celle qui oblige, pour avoir quelque chance de supprimer une maladie dangereuse, à sacrifier un membre sain.
>
> Quand, en fin d'opération, on songe à l'effroyable mutilation que l'on vient de faire pour un gain eventuel, on sent se dédoubler sa personalité chirurgicale: le technicien sportif qui vient de réussir quelque chose de difficile et qui est satisfait, et le médicin thérapeute qui doute de lui en jaugeant le sacrifice consenti."

Finally, when despite the heinous magnitude of the primary surgical undertaking to rid the patient of his load of malignant disease, metastases unhappily supervene, let the surgeon derive some solace from those lines from Ovid:

> " . . . Nec tam
> Turpe fuit vinci quam contendisse decorum est."*
>
> *Metamorph. IX.* 6

(*See also British Surgical Practice* Amputations, Vol. 1, page 178, S. Key 24)

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[illegible] *Surg*, 39, 536.

* Nor was it any disgrace to be worsted, but rather an honour to have fought at all.

HYDRO-URETER

By D. INNES WILLIAMS, M.D., M.Chir., F R.C.S
Surgeon, St. Peter's and St. Paul's Hospitals; Genito-urinary Surgeon, The Hospital for Sick Children, Great Ormond Street, and Whipps Cross Hospital

Despite some confusion of nomenclature the convention now accepted is that the term hydro-ureter refers to any state of chronic dilatation of the ureter, while mega-ureter is reserved for those in which there is no obvious organic cause of obstruction to account for the dilatation. It is clear that with the advance of knowledge the cases assigned to the mega-ureter group will gradually diminish in numbers, as we attain a better understanding of specific causes; meanwhile, both these conditions constitute a serious and by no means uncommon problem in treatment, which is the chief subject of this article

GENERAL CAUSES OF BILATERAL HYDRO-URETER

Polyuria

The ureter is a muscular tube whose function is to transport urine from the kidney to the bladder, and it is logical to consider first the effects of an excessive output from the kidney In fact the ureter is capable of dealing effectively with a volume of urine many times greater than its normal load; it does this by propelling downwards a greater volume with each wave of contraction and by accelerating the rate of these

rules regarding the limits of normality, and the observer must necessarily depend upon his own past experience Diabetes insipidus is, for practical purposes, the only condition in which a primary polyuria is responsible for a degree of dilatation which could be considered as a hydro-ureter, and this will at least regress when the normal output of urine is restored by Pitressin. In many serious renal diseases there is a polyuria of renal origin which may play a part in the persistence of dilatation but it is unlikely that this secondary polyuria is ever itself the initiating cause of a hydro-ureter.

Infection

Quite apart from its effect upon the bladder, urinary infection has an action upon the ureteric musculature which may be productive of a mild dilatation. In many cases of recurrent or severe pyelitis in children, the muscle appears to be rendered atonic and the ureter, particularly in the lumbar segment, is dilated. This change is reversible and normal pyelograms may be obtained after sterilization of the urine The muscle is never completely paralysed and the mechanical stimulation resulting from the passage of a ureteric catheter or from sudden distension with injected fluid is sufficient to start off vigorous contractions; it is for this reason that in retrograde pyelograms such ureters appear very much less dilated than they do in the intravenous studies. This infective dilatation of the ureter (lumbar ureterectasis) complicating pyelitis is of little practical importance and need not influence treatment at all, but the effects of infection complicating hydro-ureter due to other causes must always be borne in mind.

In chronic inflammatory states of the kidney—for instance, in lon calculus disease and in contracting pyelonephritis—the inflammatory pr affect also the ureteric muscle, which is progressively replaced by fibr rendering the ureter a little dilated and incapable of contraction.

Pregnancy

Bilateral hydro-ureter of moderate degree is to be expected during pregr dilatation affects chiefly the lumbar segment of the ureter, and is commo marked on the right side. Although somewhat similar dilatation may b association with other pelvic tumours, it is generally conceded that in p endocrine influences cause a relaxation of the ureteric muscle and are respo the dilatation. Normally the ureter regains its tone within a few weeks of and if dilatation persists some other cause should be sought.

Bladder disorders

Retention

At all ages retention of urine due to bladder-neck or urethral obstructio most common cause of hydro-ureter. In acute retention, the ureteric dilatation to be directly related to the increased intravesical pressure: the ureter is u propel urine into the bladder and becomes distended by the continued outp the kidney. This type of dilatation shows a rapid return to normal after decom of the bladder. In chronic retention, on the other hand, the rise of intravesical p is by no means so great, and other factors must play a part in the developr hydro-ureter

When chronic obstruction has led to considerable hypertrophy of the d muscle, the bulk of tissue surrounding the intramural ureter sometimes app obstruct the flow of urine into the bladder This is particularly evident in con obstructions, and when in such cases the bladder has been emptied and allo contract around an indwelling catheter, the intramural ureter may be com closed off. In this emergency, nephrostomy or ureterostomy is necessary to pr the function of the kidney, but the hazard can usually be avoided by insti intermittent, rather than continuous, bladder drainage

In other cases, chronic retention has the effect, not of building up the mu tissue around the ureter, but of breaking down the valvular action of the ur vesical junction, and allowing the establishment of reflux. Reflux of the bl contents up the ureter probably occurs, though rarely, in normal subjects w violent bladder contraction coincides with the opening of the ureteric orifice. occasional reflux does no harm, but when the uretero-vesical valve is comp [illegible] force of every detrusor contraction is brought to bear upo [illegible] is then likely to prevent the return to [illegible]

Contracted bladder

Hydro-ureter accompanies any condition in which the bladder capacity is gr reduced, and may be so extreme that the ureters take over the reservoir functio the bladder. Vesical contraction may be due to tuberculosis, either active or hea irradiation cystitis, or Hunner's ulcer As in retention, increased intravesical press detrusor spasm and reflux all play their parts in the establishment of the dilatati

Spinal cord lesions

Bilateral hydro-ureter is a feature of many neurological disorders, but there is evidence that the central nervous lesion ever affects the ureters directly; it does

because of the derangement of bladder function, and the degree of hydro-ureter is more or less in proportion to the degree of vesical retention.

Pathology of the secondary hydro-ureter

The reaction of the ureter to vesical retention varies somewhat according to the age of the subject. In elderly patients, usually with prostatic obstruction, the earliest sign of dilatation is to be seen in the pelvic segment of the ureter: it is of slight degree and only evident in good pyelograms With the progress of the disease a hydronephrosis develops, with well-marked dilatation of the calyces, while the ureter remains little more than two or three times its normal diameter. This predominance of hydronephrosis over hydro-ureter is a feature of adult life; the proportions are completely reversed in the foetus and infant, and an intermediate state is observed in children

In the newborn infant with severe obstruction, as with congenital urethral valves, for instance, the ureters are found to be enormously dilated, elongated and redundant, while the kidney remains small and even on occasions hypoplastic. The volume of urine retained in the ureters in such a case is often much greater than that in the bladder, but this extreme hydro-ureter does not indicate any intrinsic ureteric disorder. Throughout early childhood this greater distensibility of the ureter can be observed, and in mild obstructions of early onset dilatation of the pelvic ureter, without involvement of the lumbar segment, may be seen

Asymmetry, one side being much more dilated than the other, is another important feature of the hydro-ureters resulting from congenital lower urinary obstruction and once again need not indicate a ureteric origin for the disorder.

Elongation of the ureter is a necessary accompaniment of any gross dilatation since the muscle bundles describe a spiral course around the lumen; elongation between the two fixed points of the bladder and the kidney involves the formation of kinks. The first kinks to be seen are at the pelvi-ureteric junction and near the crossing of the iliac vessels. They may ultimately become so extreme as to form a secondary obstruction to the flow of urine At its junction with the bladder, the ureter must necessarily narrow down to pass through the detrusor muscle and, in fact, it is often narrowed a short distance proximal to the muscular layer when it first comes within Waldeyer's sheath, the outward prolongation of the adventitia surrounding the base of the bladder Radiologically this narrow segment at the lower end of the ureter may appear surprisingly long and has sometimes been supposed to indicate an intrinsic ureteric disorder. The musculature of the dilated ureter is hypertrophied and once it has passed a certain point the bulk of hypertrophied muscle will prevent a subsequent return to normal

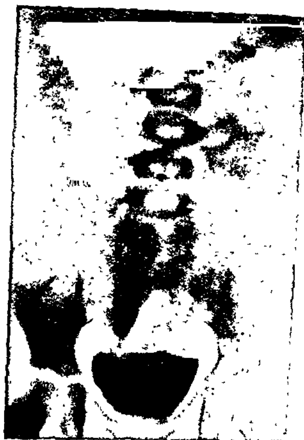
ORGANIC OBSTRUCTIONS OF THE URETER

Well-recognized and easily diagnosed obstructions such as stone and new growth require no comment here but there are certain obstructive causes of hydro-ureter, both congenital and acquired, which are apt to be confused with the purely functional disorders. Congenital ureteric strictures are rare but there can be no doubt of their occurrence, they may be seen at either extremity of the ureter or less commonly at some intermediate point. The wall of the ureter at the site of the stricture has been thinned out in the author's cases, with an attenuation or loss of the normal muscular layer; the enormously dilated proximal ureter bulges over to one side of the stricture, causing an additional valve-like obstruction.

Congenital extrinsic factors may also cause obstruction, particularly where a vessel, arising from the iliac leash, crosses and kinks the lower end of the ureter (Fig 83) Bands and vessels in this region are not always easy to display at operation and may be severed before their significance is realized, the dissected ureter then shows an

abrupt transition from a hypertrophied and dilated segment to a normal segment without apparent cause, so that an intrinsic disorder is suspected.

Chronic retroperitoneal inflammatory processes may strangle the ureter and produce urinary symptoms long after the causative lesion has recovered and been forgotten. An origin in female genital tract infections or in an osteomyelitis may be traceable, but at times plaques of fibrous tissues are found in the retroperitoneal plane surrounding the ureter for which no explanation can be given. The ureter itself may be surprisingly normal when freed from its long fibrous tunnel.



[illegible] which comes from the lower pelvis of a double kidney is obstructed at its lower end.

HYDRO-URETER IN RENAL AND URETERIC ANOMALIES

The ureters draining double kidneys exhibit states of chronic dilatation much more often than do the normal organs and it is natural to suppose that some congenital defect of their structure is responsible for this tendency. In general, it appears that an abnormality of their outlet resulting in a functional obstruction is the important factor. It must be remembered, however, that double ureters are common and will appear occasionally as complications of other types of mega-ureter.

When the two ureters from one kidney join together above the bladder, there often appears to be some interference with peristalsis at the point of junction, and consequently an obstruction to one or both tributaries. Even if there is no dilatation there appears to be an increased liability to urinary infection in these circumstances. When the two ureters open together in the bladder, that from the lower pelvis has its orifice at approximately the normal site while that from the upper pelvis opens somewhat nearer to the bladder-neck and medial to its fellow. This arrangement is of course compatible with entirely normal function but once again one or both ureters may be dilated. Where only one of the pair is affected it is a curious finding, both in the author's series and in the cases recorded in the literature, that the dilatation

much more often involves the ureter from the lower pelvis, despite its apparently more normal opening. This state of affairs is reversed when the ureter from the upper pelvis has an ectopic termination, at the bladder-neck, in the urethra or in the genital tract; it is then the only dilated element.

The ureters draining ectopic or fused kidneys are often a little dilated and redundant in infancy. Ureters from solitary kidneys, even when normally placed, are sometimes grossly dilated. It does appear that any defect of the normal anatomical development of the upper urinary tract is apt to be associated with a functional defect of the ureter.

MEGA-URETER

Natural history

When the many examples of hydro-ureter so far discussed have been eliminated, there remains a considerable number of cases presenting chronic ureteric dilatation, commonly grouped together under the heading of mega-ureter or megalo-ureter The great majority of these disorders come to light during infancy and childhood and it is exceptional for any case to suffer the first symptom after the third decade of life The condition is frequently bilateral, particularly when signs appear in childhood, and in any series which includes a large proportion of children the unilateral cases will be in the minority Girls appear to be affected slightly more often than boys, a feature which contrasts sharply with the group of lower urinary obstructions. Some mega-ureters may well represent an acquired disorder but advanced changes are found in infants sufficiently often to make it certain that there is a congenital abnormality in the majority· the comparative scarcity of cases in adult life must indicate therefore either a high death rate or else a possibility of satisfactory adaptation to the circumstances produced by the anomaly. In the past the mortality due to complicating infections has undoubtedly been high but it has been considerably reduced by the use of antibiotics and there are now many adolescents growing up who appear to have come to terms with their disability, though they must have but a slender reserve to withstand the hazards of pregnancy or acquired disease.

Group I

On reviewing a large series of cases of mega-ureter (Williams, 1954) it became clear that some subdivision of the group was required. In the first place there are a number in which the dilatation appeared to be reversible with medical treatment. These cases, almost all girls, were suffering from a severe urinary infection, with cystitis, and with moderate bilateral hydro-ureter (Fig. 84). Cystograms during the initial phase showed a bladder of average capacity and reflux of the bladder contents into the dilated ureter Cystoscopically the ureteric orifices were oedematous and somewhat rigid. The reflux did not persist after the control of infection by medical means, and provided the urine could be kept sterile, the ureters gradually returned to their normal proportions It seemed reasonable to conclude that the hydro-ureter resulted from the action of infection upon the ureteric muscle, together with the effects of reflux. Six of the author's cases have shown complete recovery and Heyman and Martin (1949) demonstrate similar restitution in a case of advanced hydro-ureter. It is clear that the urinary infection must be accompanied by a pyelonephritic process, and the intrarenal lesion itself might lead to recurrences and fibrosis not only in the renal parenchyma but also in the ureter, so that the dilatation would be no longer recoverable. In certain cases of advanced renal failure accompanying a moderate degree of hydro-ureter, it is believed that some such process has been operative and that in these it is unnecessary to postulate a congenital disorder of ureteric function

Group II

In the second big group of mega-ureter cases no such simple explanation would suffice. The dilatation was frequently extreme, it was present from early infancy and



FIG. 84.—A girl presenting at the age of 8 years with chronic urinary infection. (*a*) The first intravenous pyelogram: moderate bilateral hydro-ureter. Reflux was present, and the ureteric orifices were oedematous. (*b*) An intravenous pyelogram after 5½ years, the infection having been kept under control. (*By courtesy of Ann. R. Coll. Surg. Engl.*)

accompanied by an unusual disturbance of micturition. Cases have, for the most part, come to light as a result of investigations for urinary infection, palpable enlargement of the kidneys or a failure of normal development consequent upon renal insufficiency. The dilatation affects first the lower end of the ureter and extends upwards: a hydro-ureter without hydronephrosis may be present soon after birth. The ureteric orifices may be normal but are commonly relaxed, and many gape so widely that the interior of the ureter can be inspected endoscopically. Vesico-ureteral reflux during micturition or expression of the bladder contents is almost invariably found (Fig. 85). No disorder of micturition is noticeable during infancy, but after the first two or three years, provided there has been no overwhelming urinary infection, it becomes apparent that micturition is curiously infrequent, performed perhaps only twice in 24 hours, and that the bladder is capable of holding without discomfort a volume of urine greatly in excess of normal. Despite this large capacity and defective sensation, the bladder is for a long time emptied without difficulty and without residuum, though ultimately some have progressed to a state of chronic retention Incontinence is very seldom observed and there is no evidence of a central nervous lesion. Organic obstruction cannot be found at the bladder-neck or in the urethra on urethroscopy or urethrography, and on palpation at operation the internal sphincter feels if anything laxer than normal Even in the stage of retention trabeculation of the bladder-wall is slight or absent. Provided the infection can be kept under control, the natural progress of the disease is very slow and may be imperceptible, many adolescents suffering from it are able to lead entirely normal lives and the author has under his care a man aged 42 years who is able to carry on a normal occupation.

The disturbance of bladder function in these cases is clearly of the greatest importance and it is suggested that the primary cause of the ureteric dilatation is to be found in the bladder. Its nature remains obscure, however, and the term "mega-ureter-megacystis syndrome" is used to indicate the findings without attempting an explanation. Svensen and his colleagues (1952) have described similar cases in association with Hirschsprung's disease, and postulate a failure of the parasympathetic system in the bladder as the cause of the disorder. They do not claim that the ganglion cells are absent from the bladder, as they are absent from the bowel in Hirschsprung's disease, only that they are less numerous than normal, and it must be admitted that the density of ganglion cells in an organ as distensible as the bladder is difficult to judge. In a series of 90 cases of Hirschsprung's disease treated surgically at The Hospital for Sick Children, Great Ormond Street, no urinary disorder not attributable to the operation was encountered, though several cases of bladder-neck obstruction and a few of mega-ureter were associated with severe constipation of the "colonic inertia" type. Whether Svensen's hypothesis will ultimately prove correct is as yet uncertain but it has no great practical importance at present: the biopsy method which has established value in Hirschsprung's disease is inapplicable to the bladder since small samples obviously cannot allow an estimation of the density of the ganglion cells

Group III

Apart from the two categories of mega-ureter so far described, there is a group, mostly of unilateral cases, in which no disorder of bladder function is discoverable The ureteric orifices are cystoscopically normal as long as the infection is controlled, and there is no reflux of vesical contents on micturition—an important feature in the clinical diagnosis of the group. The ureters are commonly dilated down to the level of the bladder-wall, the musculature is hypertrophied and actively contractile unless the wall has been rendered rigid by a chronic inflammatory process In many cases described in the literature the dilatation has ceased abruptly an inch or two above the bladder without apparent cause; only one such case has occurred in a series of 75 patients with mega-ureter available for personal review, and it is suggested that,



FIG 85

FIG. 85.—Cysto-urethrogram performed by manual compression of the abdomen under anaesthesia. Boy aged 4 months investigated for failure to thrive; no evidence of urinary infection, normal urethrograms and no sign of lower urinary obstruction, but free reflux into grossly dilated ureters



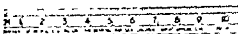


FIG. 86

FIG. 86.—Unilateral mega-ureter with secondary stone formation in a girl, aged 5½ years, investigated for haematuria Functionless left kidney, normal right kidney and ureter, no organic obstruction at the lower end of the dilated left ureter. *Nephro-ureterectomy Specimen shows the hypertrophy of the ureteric muscle, most marked at the lower end; the ureter was actively contractile.*

in some of those reported an extrinsic obstruction has been overlooked. No satisfactory explanation of this type of dilatation has been offered as yet; a study of the nervous elements in the ureteric wall has not so far proved helpful. Occasionally a valve-like flap of mucosa is present at the site of the obstruction though it is seldom clear whether this is the primary obstructive lesion or merely the result of the proximal dilatation Unilateral mega-ureter is occasionally encountered at autopsy in newborn infants who have died of other diseases, and a congenital cause is therefore unquestionable. In the absence of infection the progress of the dilatation is very slow indeed, so that no change may be discernible over a 10-year period. Stone is a frequent complication of this type of mega-ureter (Fig. 86) whereas it hardly occurs at all in the mega-ureter-megacystis syndrome. Haematuria and pain are common presenting signs in contrast to the almost invariable urinary infection in the other types.

Diagnosis

Pyelography

There is no clinical sign or symptom of a mega-ureter and the diagnosis can be [illegible]

in its performance if full use is to be made of it. The dilated ureters fill slowly with dye-containing urine; very late pictures are therefore essential and it is sometimes *worth giving a second injection after one hour to keep up the concentration.* Once the presence of a dilated ureter has been established by pyelography, the diagnosis of mega-ureter must depend upon the exclusion of other causes of dilatation.

Cystography and cystoscopy

The acquired obstructions are, for the most part, easily recognized, but difficulty may arise in the differentiation of congenital lower urinary obstructions and of organic ureteric obstructions. Where there is any suspicion of urinary retention micturating cysto-urethrograms are an important ancillary to urethroscopy, and will demonstrate beyond doubt a urethral lesion; but congenital bladder-neck obstruction (Marion's disease) is itself a difficult diagnosis to establish and very hard to distinguish from some types of mega-ureter. The observation of a trabeculated bladder with hypertrophy of the internal sphincter will usually betray the obstructive lesion, but even in the absence of these signs many urologists will not be content without a therapeutic test, and where residual urine is present the diagnosis of mega-ureter-megacystis syndrome can only be affirmed by palpating the bladder-neck at operation and demonstrating that a wedge resection of the sphincter is of little benefit.

Retrograde ureterography

If the bladder-function is unquestionably normal, careful ureterograms must be made, demonstrating the lower end of the ureter and the site of the narrowing A bulb-ended ureteric catheter placed just within the orifice is sometimes of assistance in obtaining these pictures.

Cystometrogram

The unqualified diagnosis of mega-ureter is insufficient for the purposes of treatment: the presence or absence of renal anomalies and of vesico-ureteral reflux must be established radiologically. Evidence regarding bladder capacity and sensation can be derived from the history and if necessary by recording intra-vesical pressure changes as the bladder is distended with fluid. An estimate must be made of the renal function on both sides, by the appearance of the intravenous pyelogram or by more accurate methods.

Treatment

The treatment of mega-ureter is not primarily surgical, and every effort should be made to avoid the necessity for operation. Provided the urine can be kept sterile,

and the effects of back pressure upon the kidneys minimized, the progress of the disease can generally be checked so that the patient can lead a normal life despite the abnormality.

Urinary antiseptics

In bilateral diseases it has been indicated that some cases will improve with simple sterilization of the urine. This may require the use of an antibiotic, but recurrence of infection can often be prevented by continuous treatment with a sulphonamide; Gantrisin has proved a suitable drug and is used in doses ranging from 0·5 gramme daily for infants to 1·5 grammes daily for adolescents. It may be used for periods of many months, or even years, with benefit and its efficacy is often demonstrated by the rapidity with which infection recurs as soon as the drug is withheld. When this measure is ineffective repeated courses of antibiotics may be required.

Regular micturition

Whenever there is reflux of the bladder content, the intravesical volume and pressure must be kept low by regular and frequent micturition at about two-hourly intervals. As already pointed out, children with the mega-ureter-megacystis syndrome will, if left to themselves, go all day without passing urine, and their bladders may contain 30 ounces and upwards· a strict regime, regardless of bladder sensation, is therefore required. In a few it is found that although there is a considerable residuum after one normal act of micturition, a second attempt a few minutes after the first will empty the bladder completely. A trial should be made of this method and, if effective, a regular routine of *miction en deux temps* established.

Urethral dilatation

In any case with a large residual urine, it is reasonable to believe that any measure which reduces the urethral resistance will improve the bladder function. The difficulty of distinguishing the mega-ureter-megacystis syndrome from Marion's disease makes it almost inevitable that a bladder-neck resection will be performed; in fact this measure may lead to some improvement, but in the author's cases wide instrumental dilatation of the urethra, carried out through a perineal urethrostomy in boys, has been rather more effective.

Cystostomy

Suprapubic bladder drainage may be temporarily helpful in cases of severe urinary infection and renal failure but a permanent tube is seldom satisfactory in children, and prevents resolution of the infection.

Uretero-cystostomy

Bilateral mega-ureters without reflux, and without bladder disturbance, occasionally require surgical intervention at the uretero-vesical level. Most may safely be left alone as long as the urine is sterile, but if there is stone formation, evidence of increasing dilatation, or ineradicable infection, a uretero-neocystostomy should be performed. This operation is probably preferable to ureteric meatotomy or to lateral anastomosis between the dilated ureter and the bladder, since it provides an opportunity for removing the dilated "sump" at the lower end of the ureter and straightening out some of the kinks It is seldom possible to form a valvular opening at the site of re-implantation in cases of gross hydro-ureter, though this is naturally desirable: a careful mucosa-to-mucosa suture line should be inserted, and the detrusor muscle closed around the entering ureter. It is not sufficient simply to remove the stones from these mega-ureters; they will recur unless the uretero-vesical junction is reconstructed at the same time.

Nephro-ureterectomy

Unilateral mega-ureters may be treated on similar lines, though in older children and adults, if it can be demonstrated that the contralateral ureter is absolutely normal,

and renal function on the affected side is poor, a nephro-ureterectomy should be undertaken. This will often be the treatment in cases of contracted pyelonephritic kidney with moderate hydro-ureter If a kidney has two ureters, one of which is dilated, heminephrectomy with ureterectomy is the ideal treatment

ACKNOWLEDGEMENT

I am glad to acknowledge my indebtedness to Mr. T. Twistington Higgins, Consulting Surgeon to The Hospital for Sick Children, who first introduced me to the problems of children's urology, and who passed on to my care many of the cases referred to in this article.

(*See also British Surgical Practice* Kidney and Ureter—Cysts, Vol 5, page 244, S Key 208)

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so quickly (4 hours) that there has been no characteristic stool to suggest the cause of the crisis.

Non-fulminating cases

Not all cases are as fulminating as this and after a few hours the diarrhoea becomes copious and offensive and on the second day may contain shreds of the sloughing intestinal mucosa or even incomplete casts of bowel lining. When the disease is not fatal the diarrhoea gradually abates after three or four days and the crisis has passed. The intestinal lesion heals completely and the patient is often restored to normality within 10 days.

Fluid and electrolyte loss

During the stage of shock which closely follows the onset of the disease in all but the mildest cases the blood is concentrated (as shown by the haematocrit) due to the enormous loss of fluid into the bowel lumen through the diseased bowel wall. As much as 5 litres have been recovered from the bowel *post mortem* but three or four times this amount may be passed with the diarrhoea. Such a loss seems to occur on occasions at a rate tantamount to a severe haemorrhage and with a normal circulating fluid volume of only 2·5–3·0 litres the loss may be too rapid to be naturally compensated and circulatory failure and death can occur within 4–6 hours. With so rapid a progression there is little time for much change in the electrolyte figures, but in less fulminating cases which persist over 48 hours the loss of chloride and potassium and sodium result in corresponding alteration in the blood levels. There is commonly oliguria or even anuria according to the severity of dehydration and hypotension.

Bacteriology

Culture of the faeces has revealed, when appropriate media are used, a high incidence of *Staphylococcus aureus*, which may be present in overwhelming quantities. It is not always present and will often be missed if routine measures only are used. The medium used should be selective for staphylococci and contain 0·25 per cent of phenyl-ethyl alcohol in nutrient agar in order to discourage *Bacillus proteus* and other organisms which may overgrow the plate. These staphylococci are almost always relatively resistant to penicillin, aureomycin, terramycin and streptomycin, though sensitive to erythromycin, and may sometimes be recovered from the gastric aspirate in excessive numbers and occasionally from the blood stream.

POST-MORTEM FINDINGS

There has been no lack of morbid material and the post-mortem findings are well known. Typically the small bowel alone is involved, though less frequently the large bowel and even stomach and oesophagus are similarly though perhaps less severely affected. The peritoneal cavity is usually normal and any peritonitis quite incidental.
There may be a little free fluid, though this al [illegible] ly due to the recent [illegible]
rather than the enteritis. The bowel wall, ev [illegible] is not m[illegible],
and *from the outside* it is not possible to [illegible] ual diseased p[illegible]
is no macroscopic serosal inflammation or [illegible] The intest[illegible] a
moderate distension and the contents are [illegible] On [illegible] el
the mucosa is dis[illegible] a patchy dis[illegible] [illegible]led pelli[illegible]
and partly *folded* [illegible] ly, though [illegible] upon [illegible] the
bowel. This is t[illegible] in [illegible] complete [illegible] and
eventual passage [illegible] el (Fig. 89). [illegible] tissue is [illegible]),
though not obv[illegible] and the [illegible]
has yet *formed* [illegible] possibly [illegible]
membrane these [illegible]



FIG. 89—Jejunum of a patient who died on the fourth post-operative day following partial gastrectomy, showing the pseudo-membrane separating from the underlying raw *mucosal remnant.*

The most severely affected portions may extend over a length of 2 feet or more and terminate with an irregular edge. Islands of intact mucosa may intervene and two or more separate stretches of intestine may be affected. In some areas the membrane has already left and in others is perhaps still to form. Rarely the process is confluent almost from oesophagus to anus, though the stomach and oesophagus have never been affected in the writer's experience. The mesentery is not abnormal and its glands and the Peyer's patches are not conspicuous. The affected area is not necessarily adjoining an anastomosis and it is usual to find a stretch of comparatively normal mucosa between the diseased portion and the site of previous surgery. The lesions may occur both above or below a surgical resection in different patients.

MICROSCOPY

Microscopic changes (Figs. 90–93) are for the most part confined to the mucosa and where minimal only the surface layer of this The depth of the lesion increases from the apices of the villi with the severity of the process, but usually stops short of the



FIG 90—Section of small bowel showing the loosely adherent membrane in the process of separation. The basal viable glands are visible up against the muscularis mucosae. (Haematoxylin and eosin. × 33)



Fig. 91.—Section showing necrosis of the apices of the villi of the jejunum. The basal parts of the glands are relatively unaffected. Small round cell infiltration is visible in the depths. (Haematoxylin and eosin. × 112.)

base of the intestinal glands Rarely the entire depth of mucosa is involved but then perhaps only in isolated small patches. The lesion is one of necrosis of the superficial layers with desquamation of dead tissue which becomes incorporated in a fibrin clot and thus forms the pseudo-membrane In this may also be seen organisms, red cells and a few leucocytes. There is a notable lack of the ordinary ingredients of inflammation even in what remains alive in the deeper parts of the glands and submucosa. Here the predominant feature is vascular engorgement and occasional extravasation. The local recoverability of the lesion without stricture no doubt depends upon the



Fig. 92.—Section showing a later stage of a more extensive mucosal necrosis with only isolated small glandular remnants visible. (Haematoxylin and eosin. × 112.)

persistence of some mucosal elements from which regeneration can take place. Complete denudation might be expected to lead to stricture but so far none has been described, perhaps because these are the most severe cases and are least likely to survive.

AETIOLOGY

The present tendency is to ascribe the condition to an infection by resistant forms of *Staphylococcus aureus* occurring in patients temporarily debilitated by an operation or medical illness and in whom the normal inhibitory intestinal flora have been eliminated or suppressed by one or more of the usual antibiotics.



Staphylococcal food poisoning is known in epidemics from contaminated food. Such cases can be rapidly fatal but are usually observed by physicians unfamiliar with the surgical disease. Exact descriptions of the clinical course, post-mortem findings and stool cultures of an appreciable series of such cases are hard to find. In some cases a histologically similar picture may be found, though in others the findings are quite different Such a series fully compared with the surgical cases might be very instructive It is thought that an exotoxin is responsible for the cellular necrosis in both categories. This exotoxin is resistant to boiling for 30 minutes and is produced by few strains of staphylococci only. It is unaffected by low temperatures and excites no immunity in contrast with other staphylococcal toxins, and there is no other means of differentiating those colonies possessing the enterotoxin from those that do not. Other organisms such as *Staphylococcus albus*, streptococcus, proteus, *Esch. coli* and *B. aerogenes* can also produce an enterotoxin when cultured on successive starch media.

Antibiotic-resistant strains of staphylococcus

In the post-operative enteritis clinicians are now very much on the look out fo penicillin-resistant staphylococci and the frequency with which they are found whe proper methods are used is suggestive of a causative role. Nevertheless this fact can be looked at from another angle. Many of the surgically occurring cases have already had antibiotics as a pre-operative preparation for large bowel or other surgery or may have had them in the early post-operative days, and what would one expect to find growing in the faeces of such a patient other than organisms resistant to the drug in use? Unfortunately there are no figures yet available to show the incidence of this organism in a similar series of patients after operation and the use of antibiotics who have no enteritis. Nor have there been adequate bacteriological studies on the earlier reported cases. It has been shown that erythromycin eliminates these organisms from the stools as the patient recovers, but this too is to be expected in view of the sensitivity of the organisms in question. Those patients who do not die within the first 2–3 days usually begin to improve rapidly thereafter even if untreated with erythromycin and the simultaneous clearance of the stools of staphylococci with erythromycin may be no more than coincidental. Mortality figures of controlled series with and without the use of erythromycin are not available though it may be significant that in Dearing's series of 44 patients, of whom 6 died, all the deaths occurred in those who were not given erythromycin either prophylactically or for suggestive symptoms, though the comparison of case groups selected from two different standpoints is statistically open to question.

One of the difficulties of analysis is to know the exact condition of the bowel in those who do not succumb. The actual passage of shreds is fair evidence for the presence of the condition, but diarrhoea and other minor abdominal complaints may be due to a different cause. In this respect the role of antibiotics and even sulphonamides may be considered. It is well known that both terramycin and aureomycin frequently give rise to diarrhoea and sometimes to quite a severe proctitis. Reiner's cases were of this type. But this condition seems to differ from necrotizing enteritis in so far as it is usually mild, there is no circulatory crisis due to acute fluid loss, it seldom threatens life and the condition is protracted, persisting sometimes for weeks, even after the discontinuation of antibiotics; the maximal incidence is believed to be in the lower colon and rectum as this alone is open to inspection. Furthermore, membrane formation is less usual and the histological appearances are dissimilar. Nevertheless these patients frequently grow resistant *Staphylococcus aureus* in their stools, but the causal relationship remains unproven. Whether these two conditions are related is unknown, but the above condition leads to confusion by becoming included in reported series of necrotizing enteritis.

Thus in Prohaska's cases some were still suffering from diarrhoea at the end of 30–35 days. One patient was reopened and the ileum had the appearance of Crohn's disease, and in another case percolostomy "sigmoidoscopy" showed the appearances of ulcerative colitis. These cases appeared to respond to ACTH. It is doubtful whether they were suffering from the same condition though his fatal cases were less atypical.

Necrotizing enteritis was well recognized before either sulphonamide or antibiotics were discovered. It has been computed that the incidence since their use has not increased, bearing in mind the more frequent resort to and more frequent survival after major surgery in recent years. Furthermore, most modern reports include patients who have never received antibiotic or chemotherapy either before or after operation.

If the disease is due to a staphylococcus and finally to its exotoxin the severity and incidence of the lesions will depend on the numbers of organisms present and their capacity to produce the exotoxin. It seems definite that staphylococci can be present in small quantities in normal intestines and are occasionally found in almost pure growth, especially after terramycin and streptomycin and aureomycin, without

causing any harm, though whether such organisms were capable of producing a necrotizing factor is not known. Furthermore, the relationship between their resistance to antibiotics and their pathogenicity has not been worked out, though typing has shown more than one staphylococcus to be involved. If the staphylococcus is the cause then the modern use of antibiotics on a large scale, encouraging as it does the growth of such resistant organisms to the exclusion of competitors, should have increased the incidence of the disease enormously in recent years. That it has not done so is one of the weak points in the argument for the culpability of the staphylococcus There are also undoubtedly a few cases in whom staphylococci are not found despite adequate methods and others who have had no preliminary antibiotic.

Until or unless the staphylococcus can be exonerated it is pertinent to enquire where the organisms come from Their resistance to modern antibiotics especially in a patient who has had none argues an institutional origin. The food, the ward, plates and forks, the nurses and doctors are possible sources which so far have not been tracked down

Shock as a causative factor

Many of the earlier papers were concerned with the role of operative and post-operative shock in the aetiology of the intestinal lesion Experimental work had shown that such a change could be induced in animals brought into shock It is now, however, generally agreed that the shock seen in these post-operative cases comes as a result of the intestinal fluid losses from the necrotic mucosa and in most patients there has been no preceding fall in blood pressure

Other writers have sought to incriminate a type of *Clostridium welchii.*

Hypochlorhydria

The influence of hypochlorhydria on the incidence of the enteritis has been questioned, especially following gastric surgery where a temporary or permanent reduction of gastric acidity is to be expected, or where the anacidity of gastric carcinoma preceded operation However, Dearing's paper showed the existence of staphylococci in the intestine at the time of operation in several cases Furthermore, necrotizing enteritis occurs commonly enough when the stomach is operatively untouched, though it is possible that a temporary hypochlorhydria may occur during or following general anaesthesia even after extra-abdominal operations It seems unlikely that reduced gastric acidity is an important factor in this acute disease, though it has been blamed in part for late post-gastrectomy diarrhoea of a different and unrelated type, though here also there are several more important factors.

TREATMENT

Prophylactic

Until the case against the staphylococcus is proven or disproven efforts must be directed to eliminating such organisms firstly from the institution and secondly from the patient The source of such organisms should be tracked down as they may well be indigenous within the hospital and in this connexion the absence of post-operative enteritis in some hospitals may be noted It is not too late if a patient can be shown to harbour such bacteria in quantity either before or during operation, or even in the first post-operative day since prophylactic erythromycin could then be given and the disease, upon this theory, prevented In Dearing's series the intestines of 9 patients, after receiving various antibiotics, were found at operation to be infected with staphylococci in almost pure culture They were given erythromycin and developed

no post-operative complications, whereas 4 others with similar findings were not given the drug until they had developed "rather severe gastro-intestinal and systemic reactions" which promptly disappeared with the staphylococcus (Whether they actually did or would have suffered from necrotizing enteritis is not stated and probably not known.)

Definitive

Once the disease is established there is not a moment to be lost. Any unexplained late post-operative shock, particularly with peripheral cyanosis and with diarrhoea, should be treated immediately on suspicion, and in the absence of an alternative diagnosis erythromycin should be given by mouth and steps taken to be sure it reaches the intestine—300 milligrams 6-hourly is an adequate dose. It seems unlikely that erythromycin will remain the effective panacea against hospital resistant staphylococci as the capacity for developing resistance to it on the part of organisms grown in culture by means of alternative metabolic cycles is very great If the staphylococcus is the cause and it is acquired by the patient in hospital and frequent resort is made to erythromycin, the situation will soon arise in which an alternative antibiotic must be sought. Such a one does not seem to exist at present as resistance to one commonly goes with resistance to all those habitually employed, with the present fortunate, though probably temporary, exception of erythromycin.

Fluid replacement

The most essential part of the treatment consists in the intravenous replacement of the enormous fluid losses into the intestine. This may reach a figure of 30 litres in 24 hours The water is the most essential factor and there is some evidence that it is lost in excess of the amount of salt to be found in a similar volume of plasma The actual type of fluid used for replacement depends to a certain extent on the severity of the patient's condition Plasma or dextran should be used when the blood pressure is very low in the first instance. When the systolic reading begins to rise (possibly after the first 2 litres if given rapidly enough) a change may then be made to normal saline solution, alternating with 5 per cent dextrose, and later still at the rate of 1 litre of saline solution to 2 litres of dextrose. In the first 12 hours it is the volume and rate of infusion which counts rather than what it contains. Between 10 and 20 litres is not an unusual amount to be required. The guide is the blood pressure and if it does not rise or cannot be held at a satisfactory level the drip rate must be increased. Overfilling of the neck veins and basal pulmonary crepitations are the danger signals of over-infusion. There is more danger of giving too much salt than too little and after the first 24 hours electrolyte readings for sodium, chloride and potassium are obtained and further infusion modified in the light of this.

The gross exudative or choleraic phase is usually passed within the first 48 hours and with it the need for infusion and the greatest danger is over.

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(*See also British Surgical Practice* After-Care—Post-Operative, Vol. 1, page 130, S Key 17, and Intestines, Vol 5, p 121, S Key 195)

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RECUPERATION AFTER OPERATION

By A. AUSTIN EAGGER, C.B.E., M.B., Ch.B.
Medical Director, Slough Industrial Health Service

INTRODUCTION

It is now universally recognized that the responsibility of the surgeon no longer ceases when an efficient technical procedure has been carried out, but that treatment is incomplete until satisfactory resettlement or the more or less permanent placing of the patient in occupation has been attained. While rehabilitation is an integral part of all treatment, it is only comparatively recently that a programme of planned, purposeful activity, geared to the patient's physical and mental needs has been adopted in a wide variety of conditions other than orthopaedic cases. The need for a programme of this nature after prolonged hospital treatment is obvious, but there is little doubt that the greatest loss of working time in industry is caused by comparatively minor conditions, and that failure to provide adequate facilities for the rapid restoration of function after treatment of these cases has an adverse effect on both industrial production and national economy.

Kessler (1950) has defined rehabilitation as the restoration of the handicapped to the fullest physical, mental, social, vocational and economic usefulness of which they are capable—an indication of the wide field which an effective rehabilitation programme must cover. The disturbance of function after an operation and the subsequent restoration of working capacity can be affected by many factors. The nature of the temporary or permanent post-operative disability, age, social position, standard of intelligence, employment history, domestic relationships, physique, stamina and, above all, the mental attitude of the patient towards his disability and towards work—in effect the quality of the individual—are all factors which have to be taken into consideration, and all have some bearing on the extent of functional recovery. Widely differing final results are obtained in patients who apparently have had identical conditions treated with a similar technique, and there may be considerable diversity of opinion over the question of fitness for work in the same individual. This constant problem of assessing working capacity would be eased if it was possible to express the degree of functional recovery or functional loss on a more scientific basis than at present exists.

While the principle of rehabilitation as an essential part of every form of surgical treatment is readily accepted, there is not a similar unanimity of opinion amongst surgeons as to how this should be carried out in practice. This is understandable in view of the fact that rehabilitation is essentially the treatment of the individual after operation, and that, as stated, different factors influence the rate and degree of recovery of different individuals. Experience in World War II, however, has shown that group methods of rehabilitation can be employed successfully for a variety of conditions, and if facilities are to be made available for all who require rehabilitation it is obvious, for economic reasons alone, that this method of treatment will have to be adopted to a far greater extent than at present, but will require the co-operation and guidance of the surgeons concerned if it is to be successful.

FACILITIES

Facilities for rehabilitation are said to exist in some three hundred hospitals in Great Britain, but in many instances they consist of little more than a physiotherapy department and cannot therefore provide an adequate and effective system of treatment,

as physiotherapy is only one factor in restoring working capacity. While exaggerated claims have been made for the need for residential centres, there is little doubt that a proportion of suitably selected cases can be treated in centres of this nature with benefit This is particularly the case for long term cases, and when intensive treatment is required in short term cases, or when social and domestic conditions in the home may retard recovery. Here again the mental outlook of the patient, and not necessarily the condition from which he is suffering, should be the deciding factor in recommending residential treatment. Ideally these centres should be near enough to groups of hospitals to enable the staff who have been initially responsible for surgical treatment to maintain contact with patients and to take an active interest in their rehabilitation. The opportunity of observing patients at work or at exercise can enable a better assessment of functional recovery to be made, and might do much in time to bring about new standards of measurements based on normal function.

REHABILITATION IN INDUSTRY

Two or three large firms in Great Britain have established special rehabilitation workshops which are directly concerned with production, and are under the control of trained engineers who co-operate with surgeons and industrial medical officers in ensuring that the work is both of therapeutic and economic value This type of rehabilitation workshop constitutes an important link between the hospital services and industry, and has the unique advantage that it provides both work and wages at the earliest possible moment. The co-operation of employers in several small firms has been obtained to provide work which is of therapeutic value, though the number of suitable jobs is naturally more limited in these firms Bull (1950) has pointed out that there is an urgent need for a general accident service providing early and efficient surgery, and so integrated with rehabilitation and industry that the surgeon can plan and achieve the quickest return of optimal function in an environment which stimulates the patient never to lose sight of this goal Rehabilitation under continued surgical guidance, but within industry, could be a most effective and promising approach to the problem. Fig 94 gives an indication of the reduction of loss in working time which the introduction of rehabilitation facilities has brought about in the Vauxhall Motor Company.

The Disabled Persons Employment Act requires the Ministry of Labour and National Service to provide industrial rehabilitation courses for those who are unable to work owing to injury or disease with the object of enabling patients to return either to their previous employment, or to other employment which is most suited to their altered capacity for work. These facilities are provided in industrial rehabilitation units, which take over the patient when medical treatment has been completed, and after assessment of working capacity and aptitude refer a proportion of cases to government training centres for re-training

THE PROGRAMME OF REHABILITATION

The initiation of an effective system of rehabilitation at the earliest opportunity, both from the curative and preventive aspects, is of vital importance. Greater attention to the preventive aspect at the commencement of treatment would frequently lessen the need for measures to restore wasted muscles, stiffened joints and lowered morale at a later stage

Experience suggests that comparatively few patients are informed of the need for rehabilitation prior to operation, and a surprisingly large number have little idea of the nature of the operation when it has been carried out, and the temporary or permanent effect it will have on their working capacity. Pre-operative treatment from

both the mental and physical aspects can in many conditions reduce the period of disability after surgical treatment.

In the post-operative stage, while the patient is still in bed, much can be done by attention to posture and by exercise to ensure a more rapid recovery and to prevent complications. The value of breathing exercises, and, when practicable, of controlled exercise of the voluntary muscles to promote circulation, prevent stiffness of joints and maintain functional integrity will be recognized.

In many hospitals, group and individual methods of this initial form of rehabilitation are carried out in the wards under the supervision of physiotherapists, but in others the responsibility is delegated to junior members of the staff who may have had comparatively little experience in rehabilitation or knowledge of the action which should be taken for a particular condition It is, however, frequently the nurse, and in particular the sister in charge of the surgical ward who, by her experience and understanding at this stage, lays the foundation on which the success of continued rehabilitation depends. Florence Nightingale's definition of nursing as "helping the patient to live" is in effect the main objective of rehabilitation, and there is little doubt of the importance of the part which the trained and experienced nurse plays in the initiation of any system of rehabilitation after operation. It is important to create an atmosphere of assurance and well-being in a general surgical ward, and in her efforts to foster such a state the nurse can be greatly assisted by the surgeon. Patients attach great importance to examination and assurance that all is well by the surgeon who actually carried out the operation, and the same confidence is not always placed in others however competent and highly qualified.

FIG. 94.—To illustrate the reduction in loss of working time brought about by the introduction of industrial rehabilitation. (By courtesy of Dr A R. Thompson and Med Pr (1953) 230, 583)

The rehabilitation team

Success in rehabilitation must depend primarily on efficient initial treatment, and though the importance of continuity of responsibility has been stressed, the ultimate result must of necessity be brought about by the co-ordinated efforts of a team. The co-operation and active interest of many individuals may have to be obtained for the successful rehabilitation of a particular case, and in industry not least that of management and departmental supervisors.

While in hospital the task of co-ordinating and supervising the work of the team is usually entrusted to a specialist in physical medicine; in industry the works medical officer holds an appointment which is eminently suited to this purpose. He can do much to ensure that work of therapeutic value is given and to interpret correctly the wishes of the surgeon who has recommended that a patient should return to light

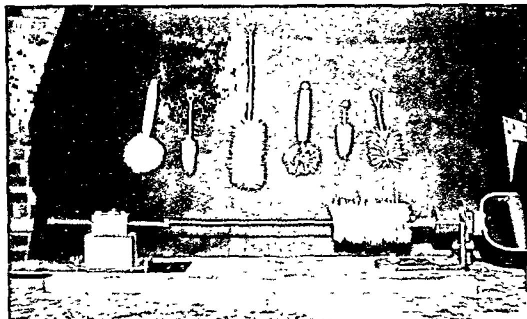


FIG. 95.—Brush-making machine used by patients in the Farnham Park Recuperative Home to restore pronation and supination.

(By courtesy of Mary S Jones and Brit J phys Med (1953) 16, 79)

work Griffiths has pointed out that in the absence of control, light work frequently means that the patient is employed on work which can play no part in effective rehabilitation, and may even prolong disability.

Mental rehabilitation

Physical measures for the restoration of working capacity can only be crowned with success if equal attention is paid to the mental aspect The patient with high morale will take advantage of every facility which is made available to aid his recovery, and until the will to work has been aroused, all efforts will be in vain It is for this reason that the correct psychological approach to each individual patient, both before and after operation, is of importance. There should be a definite statement as to whether or not the patient will be permanently incapacitated from resuming his former work, and if disability is only temporary the fact that complete recovery will occur should be constantly emphasized. Experience in a rehabilitation centre suggests that failure to assure the patient before operation that he will be able to resume his former employment has sown seeds of doubt and fear which have unnecessarily

Hydrotherapy

Th[illegible]
the [illegible]
not [illegible]

[illegible] ...mobilization, muscle weakness, nerve injuries and for the restoration of function after trauma or surgical procedures. It combines various techniques of physiotherapy with the advantage that the patient can take active exercises supported partly or wholly by water. Patients can be treated individually or in groups, in water normally maintained at a temperature of 98° F. This in itself allows heat to be applied to the body generally and with exercises improves circulation and eases pain. Both active and assisted exercises can be carried out with the minimum expenditure of energy, while weak and wasted muscles with little power can frequently function efficiently when aided by the buoyancy of the water. The early stages of re-education in walking can be initiated in such a pool and a variety of recreational exercises, not least swimming, carried out with the main object of improving co-ordination. Of the many facilities which are available in a modern rehabilitation centre none seems to have a more beneficial psychological effect than pool therapy. In the new environment movements which previously had been difficult or impossible can be carried out with comparative ease, hope is restored and the will to recover regained.

Resettlement

Placement is the process in industry by which any worker, able-bodied or disabled, is chosen and assigned to the job that will most fully utilize his skills and be within his mental and physical capacity Efficient rehabilitation can do much to ensure successful resettlement in industry after surgical treatment, and does allow an accurate assessment of working capacity to be made by actual trial. Information on the success of any particular form of treatment can be obtained by a follow-up, but while considerable attention is usually paid to the surgical result, the effect on wage-earning capacity or the financial loss which prolonged treatment has entailed may not be given the same amount of consideration. It might be of value to obtain information on these aspects after such operations as laminectomy or Judet's arthroplasty.

Table I gives details of 647 patients admitted during a period of twelve months to a residential rehabilitation centre from various hospitals. It indicates the operative treatment which had been carried out for certain conditions and shows the results obtained from the point of view of employment, both at the time of discharge and after a lapse of three months. The value of the follow-up is diminished in this case by the fact that it depends on the co-operation of the patient in completing a report, and it will be observed that many fail to do this. The follow-up, however, is maintained for fifteen months and it has been found that in the end 90 per cent of patients do reply. Investigation suggests that in the majority of cases "no reply" indicates that the patient has been restored to his former working capacity and has no complaint.

It will be noted that 70 per cent were able to resume their former or similar employment. The figure of 76 returned as unfit for immediate employment may be misleading as, in an effort to ensure accuracy, cases which did not immediately resume employment on discharge were classified in this group. Some were housewives who were able to resume light duties in the home, others had to await the supply of artificial limbs. It has to be admitted, however, that if the real test for the individual of the value of treatment is "the content of the years following treatment", some in this particular group have not achieved that objective.

REHABILITATION AFTER MENISCECTOMY

[illegible] tation
[illegible]) cases
[illegible] , after
meniscectomy.

Age, occupational group and the number of days after operation before admission to the rehabilitation centre are as shown in Table II.

TABLE II

Age-group		*Occupational group*		*Admission number of days after operation*	
17–24 years	48	Manual	36	Under 5 days	17
25–34 "	80	Light manual	80	5–10 days	137
35–44 "	48	Trading	6	10–15 "	23
45–54 "	18	Clerical	53	15–20 "	10
55–64 "	6	Domestic	10	20+ "	13
		Other and professional	15		

It will be noted that 77 per cent of cases were admitted before the tenth day after operation

The procedure for treatment in the normal case was as follows

Fifth to tenth days, non weight-bearing on crutches

Remedial treatment, half an hour twice daily.—Static quadriceps exercises; gluteal contractions, straight leg raising, foot exercises.

Occupational therapy—The foot operated power lathe has been found to be most useful for these cases The patient makes a candlestick or table lamp from mahogany or laurel.

On the *fifth day*, the patient sits with the affected leg on a stool of the same height as his chair The mechanism of the lathe is explained and a folio of designs is provided. He is encouraged to draw out one of his own choice On the *sixth day*, sitting with the leg raised, he saws out two blocks of wood from a two-inch plank—one for the shaft and the other for the base On the *seventh day*, sitting with the leg raised, the patient planes a piece of wood to the shape of a cylinder for the shaft. From the *eighth to the tenth days*, sitting on a bicycle stool with the affected leg slung under the lathe in a sling (Fig. 96), he starts turning the shaft and learns to treadle with the sound leg at 80 strokes to the minute (metronome used) He works for 20–30 minutes on the lathe, spending the remainder of the time planing or on alternative work

Eleventh to thirteenth days, stitches removed on tenth day, partial weight-bearing commenced

Remedial treatment—Assisted exercises followed by active exercises to develop the quadriceps and mobilize the knee Group exercises

Occupational therapy.—Continued as for the eighth to the tenth days but the affected leg is lowered The time spent on the lathe is increased to 50 minutes.

Fourteenth to eighteenth days, full weight-bearing

Remedial treatment—Resisted exercises in the prone position with a 25 lb spring at half tension; the tension is increased gradually. Resisted exercises with a cord and pulley circuit commencing with a 5 lb weight and increasing weight daily up to 18 lb. Group exercises.

Occupational therapy.—The patient stands part of the time, and works the lathe with alternate legs The period of working time is steadily increased. He also works on a scroll saw.

Nineteenth to twenty-first days

Remedial treatment.—Weight resisted exercises continued. General exercises with group.

Occupational therapy.—The patient finishes turning the base of the lamp—the bigger diameter entails greater physical strain. He then assembles the base and the shaft, drills, sands and polishes the finished article. Employment is then found in the garden or workshop on general duties

Length of stay in the rehabilitation centre and disposal is as shown in Table III.

TABLE III

Length of stay		*Disposal*	
0–2 weeks	38	To former employment	118
2–3 „	91	Former employment but to continue exercises as hospital out-patient	70
3–4 „	49	Similar employment	4
4–5 „	16	Lighter employment	1
5–6 „	3	Re-admitted to hospital	4
6–8 „	3	Home unfit for immediate employment for medical reasons	2
		Self-discharged	1

A follow-up at periods of 3–12 months after discharge showed that 170 were free of symptoms, and 9 had recurrence of symptoms It was found impossible to trace 21.

Rehabilitation after treatment for prolapsed intervertebral disc

One hundred patients (57 male and 43 female) were referred to the same rehabilitation centre after treatment in various hospitals for prolapse of the intervertebral disc. The site in five cases was in the cervical spine and in the remainder in the lumbar.

Age, occupational group and duration of symptoms are shown in Table IV.

TABLE IV

Age-group		*Occupational group*		*Duration of symptoms (months)*	
17–24 years	8	Manual	24	Under 6	19
25–34 „	23	Light manual	25	6–12	25
35–44 „	43	Trading	3	12–24	15
45–54 „	23	Clerical	19	24+	41
55–64 „	3	Domestic	23		
		Other and professional	6		

The nature of treatment carried out in hospital, the number of weeks after operation before admission to the rehabilitation centre and the length of stay in the centre are shown in Table V.

TABLE V

Hospital treatment		*Admission No of weeks after operation*		*Length of stay (weeks)*	
Laminectomy and spinal fusion	14	3–5 weeks	33	0–2	12
Laminectomy	69	5–10 „	33	2–3	8
Manipulation	1	10–15 „	9	3–4	17
No operative treatment	16	15+ „	9	4–5	15
		No operative treatment	16	5–6	13
				6–8	18
				8–10	7
				10+	10

Surgical treatment in some instances did not give immediate relief of symptoms when there had been prolonged pressure on the nerve root. Many of these cases showed evidence of psychological strain and in a small proportion there was a previous history of peptic ulcer. Treatment consisted of exercises to mobilize the spine and to restore muscle tone, hydrotherapy was frequently found to be beneficial but work entailing gradually increasing physical strain was essentially the method by which confidence was regained and working capacity restored

Table VI shows the disposal on discharge from the Centre and the follow-up of these cases in relation to the nature of treatment received in hospital.

TABLE VI

	Disposal							*Follow-up 3–15 months after discharge*					
Hospital treatment	Former employment	Similar employment	Lighter employment	Re-training	Hospital	Home, unfit for immediate employment	Self-discharged	In employment, free of symptoms	Unemployed, free of symptoms	In employment with recurrence of symptoms	Unemployed with recurrence of symptoms	Re-admissions	No reply received
Laminectomy and spinal fusion	5	2	—	—	2	5	—	7	—	4	3	—	—
Laminectomy	34	15	5	3	5	6	1	51	2	4	1	4	7
Manipulation	—	—	—	—	—	1	—	1	—	—	—	—	—
No operative treatment	7	4	—	3	—	2	—	9	4	1	—	—	2
Total	46	21	5	6	7	14	1	68	6	9	4	4	9

(*See also British Surgical Practice* After-Care–Remedial and Occupational Therapy and Rehabilitation, Vol 1, page 141, S Key 18)

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SICKLE CELL ANAEMIA–RADIOLOGICAL FEATURES

By W. R. COLE, M.A., M.B., B.Chir., M.R.C.S., L.R.C.P., D.M.R.(D)
Radiologist, University College Hospital of the West Indies; Lecturer in Diagnostic Radiology, University College of the West Indies

AETIOLOGY

Sickle cell anaemia is a type of hereditary haemolytic anaemia caused by the presence of an abnormal haemoglobin in the erythrocyte. Under certain conditions, especially those producing a reduction of oxygen tension in the blood, the corpuscle becomes distorted into a sickle shape, and in this state is liable to be haemolyzed, or to form with other sickle cells agglutinative thrombi blocking the smaller arteries and capillaries. This abnormal haemoglobin is controlled by a dominant gene, and obeys the laws of Mendelian inheritance. In the homozygous form the erythrocyte contains a large excess of this haemoglobin and gives rise to the symptoms of sickle cell anaemia with typical crises, a chronic haemolytic anaemia, bone and joint pains, and other symptoms, while in the heterozygous form the haemoglobin content of the cells can be shown to be made up of a mixture of normal and abnormal haemoglobin producing the sickle cell trait. Sickling occurs less readily, but may still be produced under conditions of anoxaemia. The sickling trait patient may often be symptomless and not suffer from any obvious anaemia, or from the sickle cell crises, although localized thromboses may sometimes occur.

The condition is found in Negroes, and is rarely described in white people; when it occurs in the latter there is usually a traceable colour ancestry. Furthermore the sickle cell gene may interact with other abnormal genes, for instance that of thalassaemia, or Cooley's anaemia, producing haematological disorders related to sickle cell disease (White and Beavan, 1954).

RADIOLOGICAL CHANGES

The radiological changes in sickle cell disease are due to: (a) increased haemopoiesis producing hyperplasia of the bone marrow; (b) increased haemolysis with consequent increase in the bilirubin excretion, producing a tendency to formation of bile pigment gall-stones; (c) chronic anaemia (these changes are common to any of the types of chronic haemolytic anaemia), (d) changes due to thromboses and infarctions in the haemopoietic tissue and bones (these changes are common to both sickle cell anaemia and thalassaemia); and (e) changes due to a greater susceptibility to infections, notably osteomyelitis.

Chest

As in any anaemia the heart is enlarged and dilated (Fig. 98); both ventricles can be enlarged and frequently there is an enlargement of the pulmonary outflow tract and of the pulmonary arteries, due to pulmonary hypertension. This pulmonary hypertension is caused by the increased viscosity of sickle blood especially at reduced oxygen tension, and possibly also by the occlusion of the smaller arteries and capillaries in the lungs.

These appearances can give rise to a mistaken diagnosis of rheumatic heart disease, especially when accompanied with joint pains and fever during a crisis, and they may simulate a congenital heart lesion.

The pulmonary congestion must be distinguished from tuberculous or pneumonic broncho-pneumonia. Indeed these conditions do also occur with, and can be the cause of death in, sickle cell anaemia

The antero-posterior diameter of the chest is increased due to the cardiac enlargement and a shortened trunk producing a "hoop chest". Often there is evidence of medullary hyperplasia in the ribs and clavicles, with some widening of the intertrabecular spaces, and demineralization of the bone

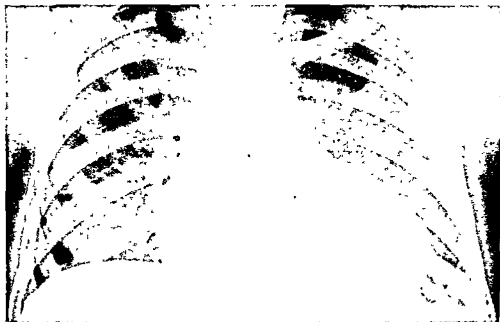


FIG 98 —Chest. Male aged 14 years with enlarged "anaemic" heart and prominent pulmonary vessels Sickling 90 per cent in 24 hours.

Abdomen

Hepatomegaly and splenomegaly may be noted on the plain film and splenic calcification is sometimes found, usually as widespread but discrete calcified nodules within the enlarged splenic shadow, and probably due to multiple splenic infarctions

Gall-stones occur more frequently and in a younger age-group in sickle cell anaemia than in normal adults, and are due to increased excretion of bile bilirubin, favouring aseptic precipitation (Fig 99) The stones are usually of calcium bilirubinate and are therefore opaque, but pure pigment stones which can only be demonstrated by cholecystography may occur (Fig. 100). The stones may be single or multiple

Skeletal system

There is a general retardation in bone growth and bone age. In the long bones thinning of the cortices with widening of the medullary spaces may be seen, to be replaced in later age by thickening of the cortices with areas of bone sclerosis, probably representing fibrosis and necrosis of the hypertrophic bone marrow These changes are not so striking or frequent as in thalassaemia In the flat bones of the pelvis and in the vertebral bodies the trabecular pattern becomes more obvious with a widening of the intertrabecular spaces (Fig 100). The vertebrae may also show a spotty sclerosis, and flattening of the bodies with loss of general height, and sometimes a biconcavity or "cupping" of the disc surfaces The cranial vault may show a similar medullary hyperplasia (Fig. 101)



FIG. 99.—Gall-bladder. Male aged 21 years



FIG. 100 — Gall-bladder. Female aged 32 years with multiple translucent pigment stones, after cholecystography with Telepaque. Note also the coarsened trabeculae in the lumbar bodies Sickling 75 per cent in 24 hours Serum bilirubin 14 milligrams per cent.

In the skull there may be expansion of the outer table producing an increased thickness of the vault, most commonly in the parietal area (*Fig. 102*), *distinguishing* this disease from the other haemolytic anaemias in which the frontals are more commonly affected. If the changes are extreme there may be a great increase in the supporting bony structure, producing radial striations, the "hair on end" skull (Fig. 103);

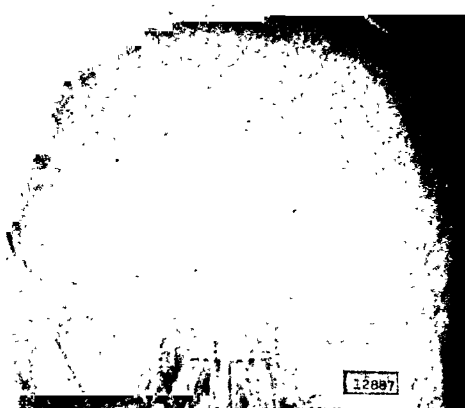


FIG. 101.—Skull. Male aged 8 years with medullary hyperplasia, increased diploic spaces without bony thickening Sickling 98 per cent in 24 hours

this appearance is diagnostic of haemolytic anaemia, but is rare. The bony changes do not appear to have any correlation with the severity of the anaemia.

Avascular necrosis

Aseptic destruction of the end of a long bone may be a feature of the disease and is most commonly seen in the femoral head epiphysis (Fig 104) If this occurs in childhood the appearances are identical with those of Perthes' disease (Fig. 105), and are probably the result of interruption of the blood supply to the bone area involved. The late result of these changes in the femoral head is osteoarthritis of the hip (Fig. 106) Similar avascular necrosis has been described in the head of the humerus (Fig. 107), and one case of necrosis involving the coronoid process of the ulna is illustrated in Fig. 108 (*a*) and (*b*) At the time of onset of pain, during a crisis, this bone appeared normal, and it was only after an interval that the radiological changes became apparent.



FIG. 102.—Skull. Female aged 17 years with medullary hyperplasia producing a thickening of the parietal area which is more marked on the left side. Sickling 100 per cent in 24 hours, 15 per cent *in vivo*.

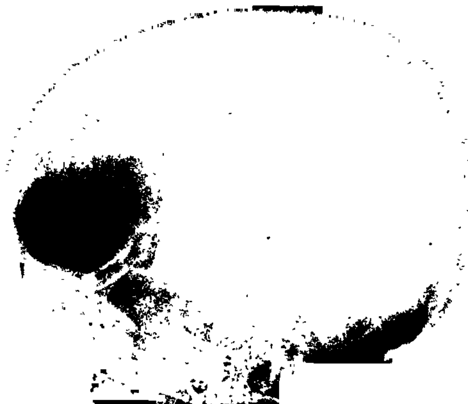


FIG. 103.—Skull. Same case as in Fig. 98. Radial striations with gross thickening of the skull producing the "hair on end" appearance, the result of medullary hyperplasia.



Fig. 104—Right hip. Female aged 44 years with aseptic bone necrosis History of pain in the hip for 2 years. Sickling 70 per cent in 24 hours.



Fig 105.—Hips Male aged 8 years with aseptic bone necrosis. Identical to Perthes' disease. Sickling 90 per cent in 24 hours, 2 per cent *in vivo*.



FIG. 106.—Hips. Male aged 35 years with severe bilateral osteoarthritis, probably following aseptic necrosis. History of pain for 9 years. Sickling 90 per cent in 72 hours.

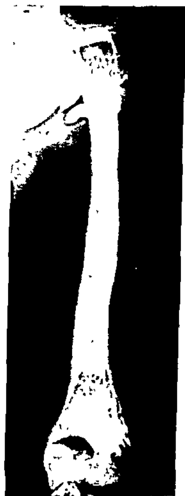


FIG. 107.—Left humerus Female aged 25 years. Old osteomyelitis of the humerus, with disordered growth of the head epiphysis. Sickling 80 per cent in 24 hours.


(a)


(b)

FIG 108 (a) and (b) —Left elbow. Female aged 22 years with aseptic bone necrosis appearing in the coronoid process one year after the original film. Sickling positive *in vivo*.

FIG 109 —Right first metacarpal Female aged 1½ years Slight periosteal reaction following a sickle cell crisis, probably an aseptic subperiosteal, thrombosis Sickling 100 per cent in 36 hours



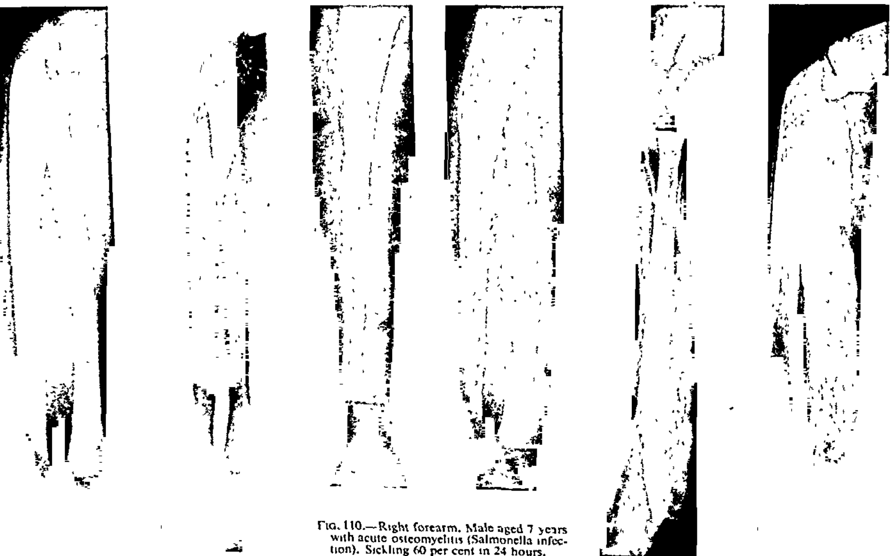


Fig. 110.—Right forearm. Male aged 7 years with acute osteomyelitis (Salmonella infection). Sickling 60 per cent in 24 hours.

Osteomyelitis

This appears to be a common complication in sickle cell anaemia (Fig 110). According to Golding it is 75 times more common than in the general population. Slight periosteal reaction following a sickle cell crisis can sometimes be seen (Fig 109) and it is probable that this represents a small subperiosteal bone infarct due to localized thrombosis. In the course of a transient bacteraemia this would be an ideal site for organisms to settle and cause an acute osteomyelitis

ACKNOWLEDGEMENT

I am grateful to my colleagues of the Medical and Surgical Divisions who referred these cases to me for radiological examination, and especially to Mr. J S. R. Golding, F R.C S , who referred the cases illustrated in Figs 104, 105, 106 and 108.

(*See also British Surgical Practice* Blood and Blood-forming Organs Blood Examination, Vol 2, page 159, S Key 60)

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YAWS—SKELETAL MANIFESTATIONS

By W. R. COLE, M.A., M B., B.Chir., M.R.C.S., L.R.C.P., D.M.R (D).
Radiologist, University College Hospital of the West Indies; Lecturer in Diagnostic Radiology, University College of the West Indies

AETIOLOGY

Yaws, or frambesia, is a disease of coloured peoples, widespread throughout such tropical countries as Africa, Asia (although not common in India), the central and southern parts of America, Australia, many of the tropical islands of the Pacific, and in the Caribbean where it is to be found in Haiti, Dominica, and Jamaica. It is called pian in the French literature and boubas in the Spanish American. In spite of its widespread geographical distribution, within the areas where it occurs there is a very localized distribution limited to villages or communities. It is essentially a rural disease occurring in people of poor living standards, living in overcrowded dwellings. It is rare in larger towns and among white people.

The infection is due to a spirochete, the *Treponema pertenue*, whose morphological and serological characteristics are indistinguishable from those of the syphilitic *T pallidum*, although the disease has different characteristics. The infection is caused by direct contact, or by an insect vector, the organism gaining admission through a traumatic or ulcerative skin lesion. It can occur at any age but is commonest in children and young adults.

CLINICAL PICTURE

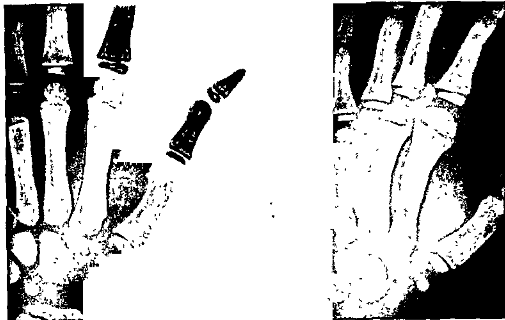
The disease is divided into primary, secondary and tertiary stages, but the distinction is far less obvious than in syphilis, and one stage frequently overlaps another. A primary sore appears at the site of inoculation, but this may be absent or missed by the patient. Within the next four months the secondary stage develops, consisting usually of multiple papules over the trunk and limbs; the lesions may or may not be widespread. These eruptions have a raised moist surface with a yellow-white exudative covering, and under this is a raspberry-like granular mass, giving rise to the name frambesia. The lesions may be annular, or circinate, and are accompanied by itching. Without treatment these either gradually subside or may develop into chronic ulcers.

Further lesions are described as tertiary manifestations, being mainly bone lesions or chronic localized ulcers. Visceral or neurotrophic lesions do not occur, for although they have been described, the reports come from areas where both yaws and syphilis exist and these lesions are probably due to the latter.

On the soles of the feet the frambesia granuloma is followed by a hyperkeratosis with fissuring and cracking of the skin persisting for many years after the infection. Sometimes the granuloma will slough away leaving a deep ulcer or clavus. In the hands there may be hyperkeratosis, desquamation of the skin, and deformities due to a dactylitis (Figs. 111 and 112) involving the metacarpals and phalanges.

Bone lesions

The bone lesions appear during or at any time after the secondary stage. The tibia and ulna are common sites, but any of the bones of the upper and lower limbs, the clavicles, or ribs may be involved. The ununited growing epiphysis tends to escape unaffected.



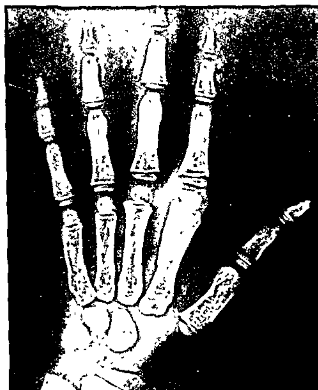


FIG. 111.—Left second metacarpal. Female aged 7 years. Periosteal reaction along the shaft of the second metacarpal, without an osteolytic lesion, and completely subsiding 7 months later.



FIG. 112 —Left hand. Male aged 17 years. Old yaws dactylitis of the first metacarpal and proximal phalanx of the index finger leaving [illegible]

The typical lesions of the long bones are either localized or diffuse osteoperiostitis, commencing as a simple uniform or laminated periosteal thickening, which organizes to produce thickening of the bone cortex. In this area of hyperactive bone formation osteolytic areas of bone destruction develop (Figs. 113, 114, 115*a* and *b*, 116 and 117). When the lesion is a localized one, radiographs in both straight and lateral projections show clearly that this cystic area is within the thickened periosteum and cortex. When the lesion is more diffuse, extensive osteolytic areas are seen surrounded by sclerotic bone, and encroaching upon the medullary space to a variable extent. Biopsy will show a chronic granulomatous inflammatory lesion eroding and replacing the bone (Figs. 118, 119, 120, 121 and 122*a* and *b*).

If untreated the lesions will gradually subside leaving an area of thickened bone cortex. Treatment by penicillin causes the lesion to subside more rapidly, the cystic areas will re-ossify, and if the periostitis is fairly recent the bony contour will return almost to normal (Figs. 113, 116*a* and *b*, 117 and 122): if the cortical thickening is already well established the osteolytic areas will re-ossify but the cortical deformity does not subside (Fig. 115*b*). Relapses can occur in untreated cases, or in cases receiving insufficient treatment, the signs of recrudescence being fresh periosteal reaction, and bone absorption either at a site of cortical thickening or over a previously unaffected area.

"Sabre tibiae" are commonly seen, with well-marked cortical thickening along the anterior tibial border, but in addition there is anterior bowing of the tibia, probably resulting from a softening of the bone due to the hyperaemia while the lesion was active (Fig 123*a* and *b*). In the hands dactylitis due to yaws may result in gross deformities when bone involvement is extensive enough to distort the whole shaft, or to interfere with the formation of the articular surface, or with epiphyseal growth.

*VDRL = Venereal Disease Research Laboratories cardio-lipin flocculation test for syphilis.



FIG 113.—Tibia Female aged 7 years (same case as Fig 111) Secondary skin yaws 2 years before Localized active bone lesion seen in the right tibia, with surrounding cortical thickening producing an early sabre tibia. After penicillin treatment, a further film 7 months later showed a normal bone Initial VDRL positive 1 16, fell to 1 . 1 after 3 months



FIG. 114.—Right elbow. Female aged 15 years. Localized periosteal reaction at the lower end of the humerus, showing an early osteolytic centre. VDRL positive 1 : 64.

(a) (b)

[illegible]



FIG. 116.—Same case as Fig. 122. Typical granulomatous osteolytic lesion with thickened cortex in the ulna, again healing with very little final deformity.

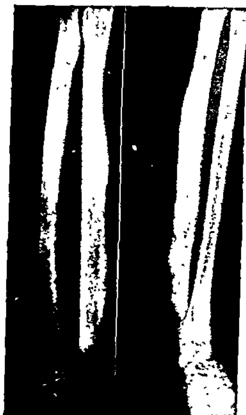




Fig 117.—Same case as Fig. 116.



FIG. 118.—Tibia and fibula Female aged 37 years [illegible]



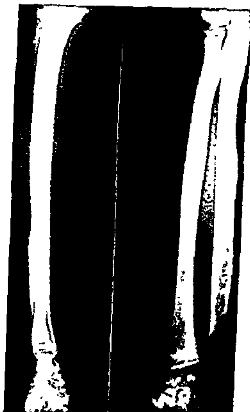


FIG. 119.—Right ulna. Female aged 15 years (same case as Fig. 114). Older cortical thickening along the shaft of the ulna containing some cystic areas on the posterior surface. Three months later the cystic areas have reossified but the cortical thickening persists.

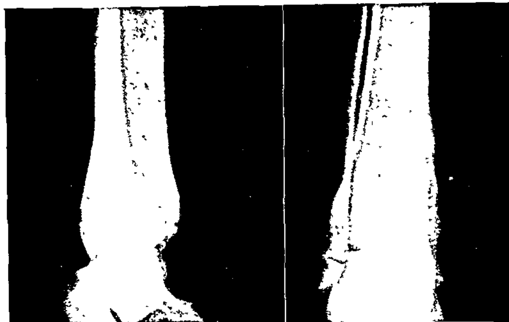
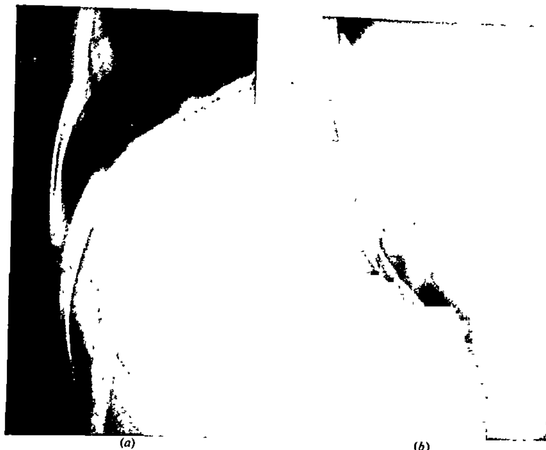


FIG 120 —Right ankle Female aged 15 years (same case as Fig 114) Periosteal thickening above the medial malleolus containing localized cystic areas.



FIG. 121.—Left ankle Female aged 15 years (same case as Fig. 114). A much more diffuse lesion of the lower end of the tibia, with large osteolytic areas and bone sclerosis. Note that the epiphysis does not appear affected.



(*a*) (*b*)

FIG. 122 (*a*) and (*b*) —Female aged 30 years Old history of a discharging abscess of the right foot, multiple joint pains for 3 years. VDRL positive 1 : 128, falling to 1 : 64 8 months after treatment Presented with a pathological fracture of the ninth right rib, due to extensive bone destruction, periosteal reaction is also seen. Three months later after treatment it has healed soundly.

While the lesions usually arise in the periosteal and cortical layers of the bone, one case I have seen showed an intramedullary lesion involving each humerus. This appeared as a central rounded osteolytic area, with very slight cortical thinning from within, suggesting a granulomatous lesion in the medulla, and with no overlying periosteal reaction. There were bone lesions of the more usual type in other bones (Fig. 124). These medullary lesions slowly disappeared after treatment.

The skull may show two very characteristic types of lesion. The first is goundou, the name given to a manifestation appearing in the late secondary, or early tertiary stage; in this there is considerable hyperostosis on either side of the nose, involving the nasal processes of the maxilla, usually bilateral and giving rise to symmetrical smooth, hard, rounded, bony masses, either the whole of the anterior part of the maxilla being involved, or the lesions remaining strictly confined to the paranasal area.

The other type of lesion is called gangosa (Fig. 125), or rhinopharyngitis mutilans, where there is a chronic ulcerative and fibrosing lesion involving the skin of the face, nose, and soft palate, with destruction of the bones of the nose and palate, and complete loss of the normal nasal contour. This is an extremely disfiguring lesion which is a late tertiary manifestation, and resembles a type of late syphilitic lesion which used to be found in Europe.

DIFFERENTIAL DIAGNOSIS

The condition which is most difficult to distinguish from yaws is syphilis, where gummatous bone lesions and skin ulcers may closely resemble those of yaws, with



FIG. 123.—(a) Right leg Male aged 20 years. Sabre tibia with forward bowing, and areas of cortical thickening in both tibia and fibula The left leg was normal. (b) There were scars on the forearm and ulceration of the right leg for 4 years VDRL positive 1 16.

identical serology and closely related micropathology. As this is especially difficult in countries where both diseases occur, it is important to establish whether or not the patient comes from a district in which yaws occurs Tertiary syphilitic bone lesions are uncommon in children and young adults

Osteomyelitis, osteogenic sarcoma, and metastases may have to be considered, and chronic tropical ulcers which may often show a thick subjacent chronic periostitis, in yaws, however, the bone lesions are not necessarily related to any existing skin ulcers

TREATMENT

The disease responds well to penicillin, especially in the early stages, a course of 10 mega-units of procaine penicillin usually being sufficient to cure the skin lesions and relieve bone pains, although re-ossification of the osteolytic areas occurs less rapidly. The serological titre response is more variable and slower than in syphilis, and may remain raised after apparent cure.

Oral aureomycin and chloramphenicol have been successfully used for primary and secondary lesions. Ampofo and Findlay (1951), and Loughlin, Joseph and Duvalier (1954) have used oxytetracycline (terramycin) with very dramatic results in the early stages, and rapid arrest of the disease with healing of the chronic ulcers in late yaws. The latter authors advise a course of 250 milligrams intramuscularly once daily for 5 days. Re-infection can occur if the patient returns to a yaws district.





FIG 124—Same case as Fig 122. Left humerus with an osteolytic *intra-medullary lesion in the* shaft, thinning the cortex from within, with no overlying periosteal reaction, which is almost invisible 9 months later. There was a similar lesion within the shaft of the right humerus at the upper end.



FIG 125 —Female aged 21 years Lesions on the face for 6 months, with an old history of yaws at the age of 10 years. The normal and soft tissue lateral views show a gangosa with loss of the nasal soft tissues and bone. In this case the palate is not destroyed

ACKNOWLEDGEMENT

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(*See also British Surgical Practice* Yaws, Vol 8, page 588, S Key 350)

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Complications

The most important complication is suppuration but few patients with acute thyroiditis show actual pus formation. The author has incised an acutely inflamed thyroid which appeared to show fluctuation but no pus was found Stock (1944) has described the occurrence of suppuration in the thyroids of Nigerian natives and there are cases reported in the literature of patients who have produced true thyroid abscesses. If the abscess is not drained surgically it may rupture through the skin, into the neck or mediastinum. Rupture into the trachea has been reported.

Treatment

The treatment of acute thyroiditis is the same as that for any acute infection occurring elsewhere in the body The patient is kept in bed and given a fluid diet since there is pain on swallowing. The most comforting local application is an ice bag but a few patients are happier with the local application of heat in the form of a kaolin poultice If the symptoms of dysphagia are severe and if, in addition, there is stridor the patient finds that it is more comfortable to hold the chin down and thus relax the pre-tracheal muscles, especially during the act of swallowing as pointed out by Lahey (1917) When there is definite evidence that pus has formed it should be drained as soon as possible and if culture allows one to discover the causative organism, then a suitable antibiotic can be administered Williams (1950) stated that thiouracil in standard dosage was of advantage, but it is difficult to explain why, unless the diagnosis was in error and the patient was suffering from de Quervain's thyroiditis Tracheotomy should rarely be necessary since drainage of the abscess relieves the pressure on the trachea.

There is no evidence that acute thyroiditis affects the endocrine function of the gland or that it progresses to chronic thyroiditis.

HASHIMOTO'S THYROIDITIS

In 1912, Hashimoto described the pathological findings in four goitres removed at operation The condition which he described and named struma lymphomatosa, is often called lymphadenoid goitre on account of the replacement of epithelium with lymphoid tissue, and this disease has been the subject of controversy ever since.

It is well known that in hyperthyroidism many glands removed at operation show areas of lymphoid infiltration and numbers of lymphocytes, and Whitesell and Black (1949) of the Mayo Clinic calculated the actual area of replacement of thyroid tissue by lymphoid tissue *from glands removed at operation from 86 patients with* exophthalmic goitre They showed that the greater the amount of lymphoid tissue present the more frequently did post-operative myxoedema result Levitt (1954) has postulated that all cases with lymphoid replacement are preceded by hyperthyroidism and succeeded by fibrosis Rabson and Arata (1949) also thought that hyperthyroidism might go on to Hashimoto's thyroiditis.

I have not seen Hashimoto's struma preceded by frank hyperthyroidism, and Lindsay and his colleagues (1952) reviewing 170 cases could find only a comparatively small number with clinical or laboratory evidence of hyperplasia Eden and Trotter (1942), however, described a patient aged 56 years who presented with marked hyperthyroidism with auricular fibrillation and a basal metabolic rate of +40 per cent. The thyroid when removed showed all the features of Hashimoto's struma but the islands of intact glandular tissue were extremely hyperplastic. This unique patient probably represented the fortuitous concurrence of hyperthyroidism and lymphadenoid goitre. In addition, many simple goitres removed surgically may show areas of lymphocytic infiltration.

It is also often observed that where lymphadenoid enlargement has been present

for a long time there is considerable replacement by fibrous tissue and it would appear that most glands which are the seat of *Hashimoto's thyroiditis* eventually end up with marked fibrosis.

There have been numerous speculations in the past that the fibrosis following lymphoid infiltration is one which goes on to the woody struma of Riedel's thyroiditis Ewing (1919), Shaw and Smith (1925), Vaux (1938) and Merrington (1948) all support this view, the latter describing a patient in whom the thyroid showed evidence of both lymphadenoid infiltration and dense fibrosis Joll (1939), on the other hand, in



Fig. 126.—Hashimoto's thyroiditis Gland removed from woman aged 44 years who had a goitre for 21 months associated with breathlessness, hoarseness, depression and lack of energy. Note bosselated surface and homogeneous pale structure.

an excellent account of Hashimoto's disease, distinguished it clearly from Riedel's *thyroiditis. He pointed out that Hashimoto's disease when followed over a number of years does not proceed to the small stony hard gland of* Riedel, and in this he is supported by the extensive contributions of Graham and McCullagh (1931) and Crile (1948, 1949). In addition, about 90 per cent of Hashimoto's struma occur in women whereas Riedel's struma is approximately as common in men as in women. Hashimoto's struma usually proceeds to myxoedema, but this is not reported with Riedel's disease. Riedel's thyroiditis may occur in a younger age-group than Hashimoto's which it would not do if it were the end-result of the latter. Finally, it is rare for Hashimoto's struma to spread outside the thyroid capsule whereas Riedel's usually does so.

Pathology

On naked-eye appearance (Fig 126) the gland may be *moderately or much enlarged* and may constrict the trachea or the great vessels at the root of the neck. It is most

unusual for the condition to have spread outside the capsule of the gland but it has been occasionally reported to have done so. The enlargement is almost always diffuse and symmetrical so that the gland retains more or less its normal shape. It is usually bosselated and is typically of a creamy-pink colour, although when the proportion of fibrous tissue is greater it may appear paler. On microscopical section the diagnosis can often be suspected without resort to the microscope because the widespread lymphoid infiltration and "germinal centres" give the section a characteristic appearance when stained with haematoxylin and eosin

The fundamental change in Hashimoto's thyroiditis appears to be the presence of so-called Askanazy cells. The change described by Askanazy is one in which the cells

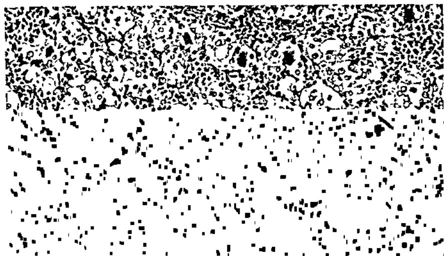


FIG 127 —Askanazy cells Note large size and stippled cytoplasm. There are many lymphocytes (× 150).

lining the follicles become swollen and have a granular pink-staining, that is, eosinophilic cytoplasm These large pink cells are often referred to in the literature as Hurthle cells and may be compared with those seen in the salivary glands in Mickulicz-Sjogren disease (Morgan, 1954) The term Hurthle should probably be avoided for, as Lennox (1948) so lucidly points out, Hurthle was describing the parafollicular cells of puppy thyroids and in fact was not even the first to describe these Rienhoff (1929) proved that there are no parafollicular cells in the human thyroid The stages in the development of a full-blown Hashimoto's thyroiditis have often been described and have recently been well illustrated by Lindsay and his colleagues (1952) Such "stages" may not really be sequential but merely the exaggeration of one or other pathological change in the gland. Both McClintock and Crile, who report having performed repeated biopsies at an interval of years, could see no obvious progression in the histological picture. The following changes are seen· (1) the follicles become swollen, with eosinophilic granular cytoplasm which may be vacuolated; these are the Askanazy cells (Fig 127); (2) the follicles become disrupted and the cells are often arranged in irregular clumps; some are seen in syncytial groups (Fig 128), (3) there is a marked infiltration by lymphocytes and plasma cells (Fig. 129); (4) lymphoid tissue may be very prominent and there are actual lymphoid follicles with germinal centres (Fig 130); it is this feature which gives the gland its most characteristic appearance; and (5) the connective tissue stroma which is usually scanty may proliferate so that broad bands of fibrous tissue interlace between patches of lymphoid tissue (Fig 131) This feature has been most marked in the two males in our own series of 33 patients, and it is possible that they represent a condition showing features of



Fig 128.—Some normal follicles remain, others show retraction of colloid and Askanazy change, others disrupted. Lymphocytes present (× 150).

both Hashimoto's and de Quervain's thyroiditis. *In some sections follicles may* appear to be re-forming but in the later stages of the disease where tissue has been removed from a patient with overt myxoedema there may be no colloid present in any section examined. Sommers and Meissner (1954) have recently demonstrated histochemically severe diffuse degenerative changes in the basement membranes in *Hashimoto's thyroiditis. These changes were not seen in any other thyroid condition.*

If radioiodine is given to the patient before operation it is possible to prepare autoradiographs from the excised tissue (Taylor, 1952). In Hashimoto's disease these show a distinctive picture of discrete and spotty uptake (Figs 132 (*a*) and (*b*) and 133 (*a*) and (*b*)), there being no blackening over the lymphoid areas.

Clinical picture

Hashimoto's thyroiditis is seen *almost exclusively in women and most frequently* presents between the ages of 30–40 years. It may, however, be seen in children and

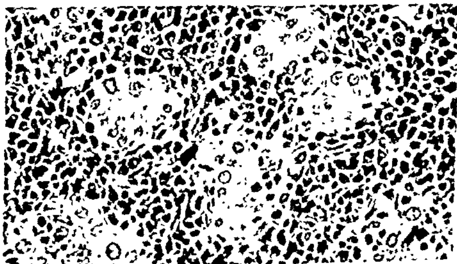


Fig. 129.—Lymphocytes and plasma cells surrounding and *invading "ghost follicles" (× 350).*



Fig. 130 —Lymphoid replacement with typical germinal centres.

there are records of seventeen cases in the literature (Gribetz, Talbot and Crawford, 1954), all in girls. There are no typical clinical symptoms and the patient only complains of a swelling in the neck which may produce local pressure and occasionally dysphagia Pain or tenderness practically never occurs On examination the thyroid gland is usually moderately enlarged and the most distinctive feature about it is that the edges feel discrete and are much more easily defined than those of a simple goitre. There may be enlarged lymph nodes palpable in the neck and especially those lying just above the isthmus which Cope (1948) calls the Delphian nodes. When the condition has been present for a considerable time there may be evidence of hypothyroidism but the radioiodine uptake is not necessarily depressed (McConahey and Keating, 1951) Since the diagnosis can only be made with certainty after a pathological examination of the gland, and since it is undesirable to remove thyroid tissue unless it is actually causing pressure symptoms in the neck, this is one of the conditions when a needle biopsy may be considered desirable Alternatively a portion of the isthmus may be removed (Heptinstall and Eastcott, 1954). Crile and Hazard (1951)

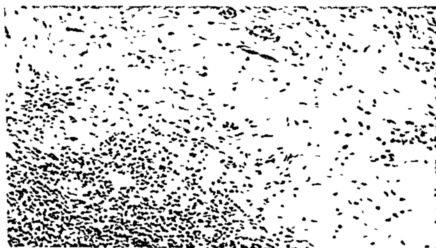


Fig. 131.—Prominent fibrosis.





(a) (b)

Fig. 132 (a) and (b) —Section through lobe showing Hashimoto changes with accompanying autoradiograph Note discrete spotty uptake.

e drawn attention to the value of the Vim-Silverman needle, and in their hands those of other workers, including my own, it appears to be entirely without risk can usually provide enough histological material for the diagnosis to be made needle is a split one as shown in the accompanying illustration (Fig. 134). For its





(a) (b)

Fig. 133 (a) and (b).—Similar to Fig. 132.

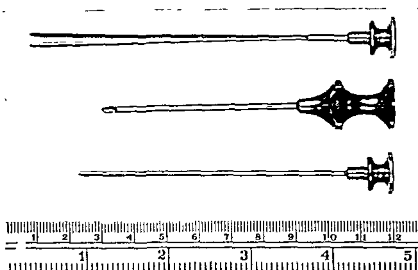


FIG 134 —Vim-Silverman split biopsy needle.

use the patient is placed on a couch and after preparing the skin a suitable spot over the middle of one lobe is infiltrated with Novocain. The trocar and cannula are introduced after nicking the skin with the point of a scalpel, the trocar is then removed and the split needle introduced and pushed forward with counter-pressure upon the gland from behind The cannula is then slid forward over the needle so that it grips the fragment of tissue which it has enclosed and is then withdrawn. The preparation which can be obtained from such a biopsy is shown in Fig. 135. It is only necessary to place a small collodion dressing over the skin wound and it is advisable for the patient to lie down for half an hour after this manoeuvre so that venous oozing is reduced to a minimum. Toxic or malignant thyroids are not suitable for investigation by this technique.

Complications

Hashimoto's struma rarely results in a very large gland but exceptions to this have been recorded. Recently, Sholl and Black described a patient with a huge substernal lymphadenoid goitre of 262 grammes, causing a superior vena caval syndrome. The process also rarely involves the tissues of the neck; I have performed a thyroidectomy

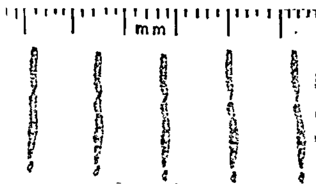


FIG. 135 —Actual specimen of needle biopsy after section.

in a woman with a Hashimoto goitre infiltrating the sternothyroid and sternohyoid muscles.

The most important complications of this condition are pressure symptoms and hypothyroidism, and if a thyroidectomy is performed myxoedema may appear within a short time.

Treatment

Since the cause of Hashimoto's struma is unknown the treatment is symptomatic; it is directed at relieving the pressure symptoms on the one hand and the hypothyroidism on the other. Pressure on the trachea can be relieved by excising the isthmus of the gland (Lahey, 1935). This can be performed through a limited collar incision, when the tissue removed is examined histologically, since the diagnosis depends on both pathological and clinical findings. Alternatively small doses of x-ray therapy (1,000 roentgens) will cause the gland to shrink very rapidly. A combination of both these manoeuvres is often employed. In either case it is likely that the impaired thyroxine production will be lowered still further.

Thyroid should therefore be given by mouth either as dried thyroid substance or *l*-thyroxine and it is necessary for the patient to continue taking it indefinitely. It has been pointed out (Statland, Wasserman and Vickery, 1951) that the administration of thyroid may make the gland smaller and softer, and it certainly relieves the patient of her symptoms.

DE QUERVAIN'S THYROIDITIS

In 1904 de Quervain of Berne described a condition which he called acute, non-purulent thyroiditis. In his article, which is beautifully illustrated with photographs of microscopical specimens, there is a clear description of a condition which for the next 30 years was only to be recognized on some 60 occasions. Professor de Quervain together with Dr. Giordanengo of Turin wrote a further account of the condition in 1936 adding 8 fresh examples Today, de Quervain's thyroiditis is quite regularly diagnosed and confirmed histologically and I have seen 6 examples in the last 3 years. It would appear that the increased frequency with which the diagnosis is now made is due rather to increased recognition of the condition than to an overall increase in its incidence. On looking through the literature it becomes clear that this condition has been described under a variety of titles. The more common of these are: acute thyroiditis (de Quervain), subacute thyroiditis (Crile, 1948), granulomatous, giant-cell, pseudo-tuberculous or acute non-suppurative thyroiditis. As with Hashimoto's disease, the diagnosis rests on the combined clinical and microscopical findings.

Clinical picture

de Quervain's thyroiditis is seen more commonly in women than men and about 50 per cent of the patients already have some enlargement of the thyroid gland. The onset is typically acute with the symptoms of a sore throat, malaise, fever and a tender or painful thyroid with pain which radiates up to the ears. The patient often sweats profusely at night and complains of weakness and lassitude. The tenderness in the gland may start in one lobe and then migrate to the other but almost invariably it involves the whole gland. No pathogenic organism has been found responsible for this condition but it has been surmised that a virus may be the causative agent (Fraser and Harrison, 1952). The white cell count is not elevated but the sedimentation rate is usually high. The radioactive iodine uptake by the gland is reduced to zero during the early weeks of the disease and, since this is not found in any other thyroid condition except severe myxoedema, it is an extremely helpful test. On the other hand

the level of protein-bound iodide in the blood is usually normal when the patient is seen, although it has been reported as high in the early stages by Lindsay and Dailey (1954). It appears that this condition resembles an acute inflammation of the thyroid which prevents further manufacture of hormone but does not prevent its normal discharge from the gland.

de Quervain's thyroiditis is a self-limiting disease and most patients recover spontaneously in from 3 to 12 months

Differential diagnosis

de Quervain's thyroiditis may be mistaken in its early stages for an acute thyroiditis of bacterial origin, but in the latter the causative organism can usually be found and the white cell count is elevated with a relative increase of polymorphs. Haemorrhage into a nodule in a simple goitre may also cause an acute onset of pain and swelling in the neck but in this case the pain is very short lived and there is no elevation of the erythrocyte sedimentation rate, nor is the radioactive iodine uptake grossly diminished. Probably the most important condition which must be differentiated from this form of thyroiditis is malignant disease, and Crile and Fisher (1953) have recently described two patients in whom a diagnosis of thyroiditis was made and after needle biopsy it was discovered that they, in fact, had carcinoma which was treated by thyroidectomy. In this condition, as in Hashimoto's thyroiditis, needle biopsy offers an excellent method of obtaining a sample of the gland which is usually sufficient for a diagnosis to be made In addition it allows that diagnosis to be made without recourse to thyroidectomy and since the condition is one which invariably resolves, this is most desirable As an alternative, part of the isthmus may be removed.

Pathology

The gland is usually only slightly enlarged and on cross-section looks paler than normal It is firm in consistence, but as the disease progresses there may be considerable fibrous tissue formation so that the gland becomes whitish and harder to the touch. The microscopical changes depend on the stage in the disease at which the biopsy is performed. There is a fairly generous infiltration by lymphocytes and plasma cells which tend to be arranged in clumps. The follicles may appear largely normal but in certain areas the follicular cells swell and disrupt (Fig. 136). Aggregations of their nuclei may mimic giant cells (Fig. 137) In addition true giant cells may appear and it has been suggested that they phagocytose the colloid from the destroyed follicles. There is a considerable increase in the fibrous stroma (Fig. 138).

Treatment

The disease is a self-limiting one but many forms of treatment have been found to relieve the symptoms, if only temporarily. King and Rosellini (1945) reported that thiouracil in ordinary doses caused cessation of pain and constitutional symptoms within a few days. Robbins and his colleagues (1951) described similar good results with injections of T.S.H (thyroid stimulating hormone prepared from anterior pituitary) and showed that the radioiodine uptake by the thyroid was reinstated by this treatment Crile has strongly recommended the use of x-rays for this condition More recently a number of workers have described good results from cortisone therapy (Clark, Nelsen and Raiman, 1953; Teitelman and Rosenberg, 1953; Lasser, 1953, and Kahn and his colleagues, 1953). It is suggested that carbimazole, 5 milligrams, be given three times a day for two weeks. If a relapse occurs a further course may be given. All manner of antibiotics have been tried but have proved useless.

Patients with this condition usually return completely to normal but a few show evidence of increased fibrosis in the gland which eventually may feel small and hard on palpation.

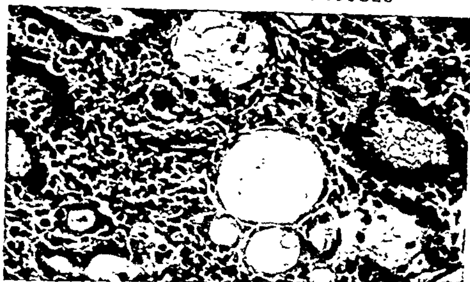


FIG. 136.—de Quervain's thyroiditis Needle biopsy. Showing disintegration of follicles and pseudo-giant cells (× 350).

RIEDEL'S THYROIDITIS

Riedel's thyroiditis is a comparatively rare condition and according to the published cases does not show the usual ratio of women to men as in other thyroid diseases; it is still, however, a little commoner in women As discussed above, this condition has often been linked with Hashimoto's disease and it has been suggested that it really represents the end-result of a lymphadenoid goitre. There is no good evidence for this and it is better to consider it as a separate entity.

Clinical picture

Riedel's thyroiditis presents as a chronic induration of one lobe of the thyroid which eventually becomes stony hard and completely adherent to the surrounding tissues The disease progresses until it involves the opposite lobe, eventually there is severe obstruction of the trachea and there may be involvement of a recurrent laryngeal nerve and even destruction of the parathyroids, leading to tetany. The condition is



FIG. 137.—de Quervain's thyroiditis. No normal follicles remain. Note large foreign-body giant cell.

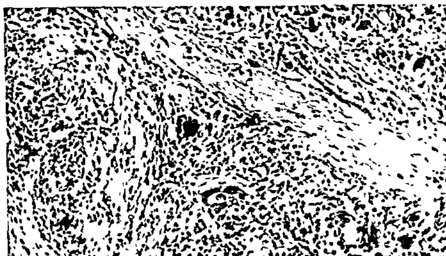


FIG. 138—de Quervain's thyroiditis showing increase in fibrous stroma.

painless, its onset is insidious and is apparently always progressive. The thyroid function is rarely interfered with and hormonal production appears to go on as usual.

Differential diagnosis

Riedel's struma is rarely diagnosed correctly before operation and the usual condition for which it is mistaken is carcinoma. However, when the neck is explored it is unusual for the correct diagnosis to be overlooked. Crile (1949) has pointed out that in a number of these patients a degenerating nodule of thyroid tissue is found at the centre of the fibrosed mass.

Pathology

Pathology of Riedel's thyroiditis is not entirely clear since the disease is rare and it has often been confused with other forms of disease which excite a fibrous reaction in the gland The typical picture is probably one of almost complete replacement of the gland by fibrous tissue with, here and there, an intact follicle containing colloid enmeshed by the fibrosis.

Treatment

The treatment of Riedel's thyroiditis is the relief of obstruction to the trachea and to the other structures in the neck. X-rays do not prevent the continuing fibrosis and since the condition is often mistaken for malignant disease surgical exploration is necessary At this exploration it is impossible to perform thyroidectomy because the gland is fused to the other structures in the neck. It may be possible to remove part of the isthmus and so release the trachea. It may be possible also, as Crile has suggested, to cut into a lobe and enucleate from its centre the degenerating thyroid nodule if this should be present Finally, it should be stressed that no attempt should be made to perform thyroidectomy since this can only lead to further damage.

ACKNOWLEDGEMENTS

It is a pleasure to record thanks to my colleagues at King's College Hospital and the Postgraduate Medical School who have allowed me to see their patients and consult their records The photomicrographs were prepared in the Department of Pathology and the illustrations in the Department of Photography at King's College Hospital.

(*See also British Surgical Practice*· Thyroid Gland—Diseases of, Vol. 8, page 256, S. Key 327.)

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ANAESTHESIA–RECENT ADVANCES IN PRE-OPERATIVE AND POST-OPERATIVE MEDICATION

BY C. LANGTON HEWER, M.B., M.R.C P., F.F A., R.C.S.

SENIOR ANAESTHETIST, ST. BARTHOLOMEW'S HOSPITAL, AND ST. ANDREW'S HOSPITAL, DOLLIS HILL; CONSULTING ANAESTHETIST, HOSPITAL FOR TROPICAL DISEASES, LONDON

ASSESSMENT AND REASSURANCE OF PATIENT

It is now generally recognized that drugs administered before operation cannot be given in a routine way if the most beneficial effects are to be obtained. It is essential that the anaesthetist should make personal contact with the patient before operation, not only to assess his physical condition, but to talk over the question of the anaesthetic and to find out any particular idiosyncrasies which he may have, for example, nausea and vomiting after taking morphine or its derivatives It is, unfortunately, easy to regard the matter lightly as merely another case, but the patient rightly thinks of an operation as one of the most important events of his life and usually appreciates an unhurried talk carried out with sympathy and kindness Such a talk with the anaesthetist can be of special value because the anaesthetic is often the principal source of the patient's anxiety.

In private practice a visit on the day before operation can usually be made without difficulty, but in hospital this may often prove impossible. It is true that the house surgeon should be able to detect any gross abnormalities likely to affect the course of anaesthesia, but he seldom has time to find out and allay the various fears and fancies with which the patient may be afflicted. For example, he may be terrified of the thought of a mask over his face with a consequent feeling of suffocation. This may well be the result of an unfortunate experience in his childhood and he will be pathetically grateful if assured that considerable advances in anaesthetic technique have been made since then, and that he will go to sleep after a small prick in his arm with no unpleasant sensations whatever.

In order that hospital patients should not be deprived of this valuable if unconscious type of suggestion, the patient is sometimes asked to attend a clinic about two weeks before operation, and not only are his problems discussed and reassurance given, but a thorough physical examination is made. It may be found that he is suffering from dental caries, diabetes, or a low haemoglobin value, conditions which may be mitigated by a few days' treatment, but which might otherwise not have been found until the day of admission and might then lead to delay and waste of a valuable bed (Lee, 1949; Loder and Richardson, 1954)

PRE-OPERATIVE MEDICATION

Drugs given the night before operation

It is obviously desirable for a patient to have a good night's rest before operation and it is only natural that apprehension will deprive him of it unless some sedative

is administered. Different drugs suit different patients and it is always a good plan to find out what tablets he has previously been given and with what result. The barbiturates are the most generally useful hypnotics for this purpose and for a fairly fit adult, butobarbital (Soneryl) 3-4½ grains or sodium barbital (Medinal) 7½-10 grains combined with aspirin 10 grains if pain is present, is usually satisfactory. Patients accustomed to the quiet of the country are often kept awake by heavy traffic and other nocturnal noises, apparently inseparable from hospital wards. The use of soft ear-plugs made of wax may prove of great service in such cases.

Drugs given shortly before operation

The term "premedication" is usually taken to refer to drugs administered about one hour before operation. These are given for three reasons. First, they should diminish the oral and tracheo-bronchial secretions, commonly stimulated by many forms of general anaesthesia. Secondly, they should allay apprehension, and thirdly, an amnesic action is valuable.

For adults

For many years the most popular "standard" premedication in Great Britain for fairly fit adults has been Omnopon (papaveretum *B.P.C.*) ⅓ grain and scopolamine $\frac{1}{150}$ grain injected hypodermically. This combination usually produces tranquillity, amnesia, and adequate drying up of secretions. Unfortunately, a fairly high proportion of patients experience nausea and vomiting after morphine or mixtures containing it, and there is no doubt that some of the sickness after operation is due to this cause. In recent years, therefore, there has been a tendency to substitute pethidine for Omnopon, the usual combination for adults being pethidine 100 milligrams and scopolamine $\frac{1}{150}$ grain. There is little difference in the observable effects except a slightly greater tendency towards euphoria, but the writer is convinced that post-operative nausea and vomiting are diminished with this mixture.

In old age

In old age scopolamine may cause restlessness, excitement, and hallucinations, for which reason atropine is usually substituted. This drug has a similar effect upon secretions and in the 70–80 years age-group, morphine ⅛ grain and atropine $\frac{1}{75}$ grain given hypodermically is usually satisfactory and causes little, if any, respiratory depression.

In childhood and infancy

Children tolerate Omnopon and scopolamine well, and somewhat complicated charts for dosage have been worked out for them. The writer has found, however, that a perfectly satisfactory and simple method is to have a stock solution of Omnopon ⅓ grain and scopolamine $\frac{1}{150}$ in 15 minims and to give 1 minim hypodermically for each year of age. At one time Nepenthe was a favourite injection for children. This preparation contains sherry and was devised as a palatable method of giving opium by mouth. The alcohol makes the solution most irritating if injected. Some anaesthetists prefer to give a barbiturate such as pentobarbitone (Nembutal) or quinalbarbitone (Seconal). The oral dose of both drugs is about 0·6 grain per stone body-weight up to a maximum of 3 grains. Rectal barbiturates are useful for nervous children over the age of 7 years who can be rendered unconscious or nearly so in bed. Thiopentone (Pentothal) is the drug generally used for rectal administration, the average dose being 1 gramme per 50 lb body-weight dissolved in 1 ounce of distilled water (this equals 0·4 millilitre of a 5 per cent solution per 1 lb). Hexobarbitone (Evipan) can be used in the same dosage. In the author's view, rectal barbiturates are inadvisable for young children and for operations where brisk respiratory reflexes are desirable immediately afterwards, for example, tonsillectomy. When the child is asleep a hypodermic injection of atropine is given. It should be observed that this

drug is tolerated well by children, and $\frac{1}{100}$ to $\frac{1}{150}$ grain is used for those above the age of 2 years.

During the past year methylpentynol (Oblivon) has been introduced as a premedicant drug and appears to offer certain advantages in children. It is administered by mouth as "oblivon elixir" about one hour before operation in a dose of from 250 to 750 milligrams (1–3 teaspoonfuls). Atropine or scopolamine should be given about 15 minutes later. Children may go to sleep with this technique but are more often awake but happy and co-operative. There appears to be a wide safety margin with methylpentynol, and respiratory and pharyngeal reflexes are not depressed to a noticeable extent. Occasionally vomiting occurs presumably from gastric irritation. It should be observed that barbiturates should not be given in combination with methylpentynol as the latter drug is an alcohol and the combination can have a cumulative effect, one fatality having already been recorded (Trotter, 1954a and b).

Young babies are usually given atropine $\frac{1}{200}$ grain only, and it is most important that an adequate dosage be given as excessive secretions can readily cause obstruction to the small airway. It is quite useless to put atropine under the tongue as was once the vogue Sedation is unnecessary for young babies as they appear to have no apprehension or recollection.

Before local analgesia

It is important to realize that adequate pre-operative sedation is of vital importance if it is decided that the operation should be undertaken with local analgesia. It is essential, however, that in this event, the full co-operation of the patient should be secured so that basal narcosis should not be employed.

Drugs which dry up secretions, such as atropine and scopolamine, should be avoided as they merely make the patient uncomfortable. Morphine $\frac{1}{4}$ grain or Omnopon $\frac{1}{3}$ grain alone can be given hypodermically an hour before operation if it has previously been ascertained that they do not tend to cause nausea or vomiting. This proviso is especially important in cranial or ophthalmic surgery where vomiting may endanger the success of the operation. Subcutaneous pethidine in a dose of 100 milligrams suits some patients well, but may cause euphoria as well as drowsiness. There is much less tendency to nausea than with morphine preparations. If none of the above suggestions are satisfactory a barbiturate such as pentobarbitone 3 grains by mouth may prove the solution to the problem, and has the advantage that it inhibits the onset of convulsions from an overdose of all the commonly used local analgesic drugs.

Basal narcosis

One of the symptoms of such diseases as thyrotoxicosis and arterial hypertension is intense nervousness and apprehension. For this reason basal narcosis is to be preferred to sedation in such cases In other words, the patient is rendered unconscious in bed before being taken to the anaesthetic room

Up to the beginning of World War II, bromethol (Avertin, tribromethanol) was used extensively for this purpose, 0·1 gramme per kilogram body-weight being the usual rectal dose. In practice bromethol fluid (that is, tribromethanol dissolved in amylene hydrate) was used, a 2·5 per cent solution being made up with distilled water. This was coloured orange with congo red to make certain that no decomposition had occurred as would be shown by a colour change to purple or blue. When the patient was asleep, a hypodermic injection of scopolamine $\frac{1}{100}$ grain was given, and the patient then sent down to the anaesthetic room Atropine should not be used as it raises the basal metabolic rate.

Rectal paraldehyde in a dose of 1 drachm per stone body-weight up to a maximum of 8 drachms has now almost entirely superseded bromethol. It is made up to a 10 per cent solution in warm water and is given slowly as a retention enema about one hour before operation with the patient in the left lateral position. Scopolamine

until the urine becomes free from diacetic acid. This may occur in quite a short time, even within a few hours, and consequently the urine (obtained if necessary by catheter) is tested every 20–30 minutes. Ferric chloride, 10 per cent, is added drop by drop to a small quantity of urine until all phosphates have been precipitated. It is then filtered and a few more drops of ferric chloride are added A wine-red colour indicates the presence of diacetic acid unless the patient has recently received aspirin or salicylic acid (Gerhardt's test).

It should be realized that if the above suggestions are carried out, emergency surgery need not be delayed until blood sugar estimations can be carried out, although these may be most useful in stabilizing the patient after operation.

If a diabetic patient does not regain consciousness within the expected time after the cessation of the anaesthetic, it is probable that hypoglycaemia is present and intravenous glucose should be given.

It has recently been shown that hypertonic glucose solution does not readily pass from the stomach into the duodenum until it is diluted by gastric secretions which increase its volume and may lead to regurgitation during the induction of anaesthesia Several deaths have been due to this cause, and it is now generally thought that if glucose is considered necessary shortly before operation, it should always be given by the intravenous route.

Chronic diseases of the respiratory tract

In Great Britain a large number of patients about to undergo surgical operations are suffering from chronic laryngitis, tracheitis, bronchitis, asthma or emphysema. This applies particularly in the winter months and to male patients who are heavy smokers Recent work has shown that these conditions can be greatly ameliorated by a few days' treatment consisting of the inhalation of a bronchodilator drug combined with physiotherapy. The writer has found that an effective method is as follows (Palmer and Sellick, 1953)

The patient inhales through the mouth a drug which is a bronchodilator and vasoconstrictor such as 1 millilitre of a 1 per cent solution of isoprenaline (Neo-Epinine solution No. 1) by means of a hand inhaler. The foot of the bed is then raised 18 inches for 15 minutes and clapping and vibratory percussion is carried out on the lower parts of the chest during the expiratory phase of respiration with the patient in both the lateral and prone positions

Coughing now produces much sputum and this regime is carried out three times a day before operation, the last treatment being just before the premedication is given. If conditions allow, further treatments should be resumed possibly in modified form after consciousness has been regained.

It is quite remarkable how long-standing "chronic chests" can be improved, and sputum practically eliminated within a few days

Liver failure

Bromethol (Avertin) is toxic to the diseased liver and should not be used.

The barbiturates are detoxicated in the liver and it is therefore unwise to give them when disease of the liver is present, among the agents (commonly) used for premedication this word of caution applies particularly to Nembutal and phenobarbitone.

Chloral also should be avoided when there is hepatic insufficiency, and even [illegible] and scopol- [illegible]

Renal failure

[illegible] are generally well tolerated even when [illegible] uld be avoided, and so also should [illegible] reted by the kidney either unchanged or after having been broken down in the liver.

MEDICATION DURING OPERATION

Although the actual anaesthetic technique is beyond the scope of this article, pre-operative and post-operative medication are to some extent concerned with it. A passing reference must, therefore, be made to two procedures which have been introduced in recent years.

Induced hypotension

In order to minimize blood loss during operation induced hypotension was developed, but experience has shown that the added risks are justifiable only in exceptional cases, for example, the removal of vascular cerebral tumours. The practicable methods for accomplishing hypotension are: (1) by high sympathetic paralysis obtained either by subarachnoid or epidural block; (2) by arteriotomy; or (3) by drugs such as methonium or thiophanium derivatives which block autonomic ganglia. It is probable that the administration of Arfonad by intravenous drip is the most generally satisfactory at the present time.

Induced hypothermia

Still in the experimental stage, induced hypothermia may prove most useful in intracardiac surgery by reducing metabolism to the point at which the cardiac circulation can be arrested temporarily to enable a bloodless field to be obtained. At present it seems doubtful whether this can be accomplished safely in man without the aid of an artificial circulation provided by some type of pump-oxygenator

The modified hypothermia associated with so-called "artificial hibernation" has been claimed to minimize shock in extensive operations (Laborit and Huguenard, 1954), but it is not yet clear whether the diminished resistance to bacterial invasion and the risk of long-term cerebral effects can be ignored

POST-OPERATIVE MEDICATION

The drugs the anaesthetist may have to use after operation are required to stimulate depressed respiration, to combat shock, and to relieve pain.

Stimulation of respiration

It is essential that patients, when returned to bed after operation, should have an adequate respiratory exchange, otherwise the incidence of pulmonary complications will rise sharply In modern practice the most likely cause of depressed respiration is that a muscle relaxant given during operation is still acting. If the relaxant has belonged to the group of "competitive blockers" intravenous neostigmine will be indicated The competitive relaxants in common use are tubocurarine, its dimethyl ether derivatives, laudolissin and gallamine (Flaxedil) The average adult dose of neostigmine for this purpose is about 2·5 milligrams preceded by intravenous atropine $\frac{1}{50}$ grain given at least two minutes beforehand The pulse must be carefully watched for at least 10 minutes after these injections, and if it slows appreciably the atropine should be repeated If the relaxant belonged to the depolarizing type of blocking agent, for example, decamethonium (C.10), suxamethonium or suxethonium, neostigmine should on no account be used as the respiratory depression may be thereby increased and prolonged Tensilon (Edrophonium) has some effect in antagonizing all types of relaxant, but its action is evanescent and uncertain.

Drug treatment of shock

If after adequate fluid replacement has been effected the patient still shows signs of operative shock, it may be necessary to consider whether the administration of an

analeptic drug is desirable. Nor-adrenaline (Levophed) reinforces the normal mechanism of increasing vascular tone without augmenting cardiac output and would seem to be the logical choice for raising blood pressure. If it is decided to use nor-adrenaline it is usually given as an intravenous drip infusion in a dilution of 1 in 250,000 in normal saline, the rate of drip being governed by the systolic blood pressure and gradually tapered off to zero. Unfortunately nor-adrenaline diminishes the blood flow through the kidneys and some authorities consider that its use is unjustified except after the removal of a phaeochromocytoma. In a short emergency, a single intravenous dose of 15 milligrams of Methedrine (methylamphetamine) may be useful to raise the blood pressure, but generally speaking the modern view is to distrust drugs for the treatment of post-operative shock.

Drugs for the relief of post-operative pain

The chief purpose of post-operative medication is the relief of pain when the effects of the general or local anaesthesia have worn off. Many efforts have been made to block nerve impulses peripherally for a prolonged period either by using long-acting analgesics or by additional injections through small-bore tubes, but unpleasant side-actions and an increase in infected wounds have offset the good results obtained The well-tried method of giving centrally acting analgesics is still the most practicable, but heroin [illegible]
vomiting [illegible]
equal to th [illegible]
not suit all patients, and like morphine and its derivatives must be discontinued as soon as possible since addiction can ensue in a surprisingly short time.

(*See also British Surgical Practice* Anaesthesia—General, Vol. 1, page 205, S. Key 26)

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CARCINOMA OF THE PANCREAS

By C. F. W. ILLINGWORTH, C.B.E., M.D., Ch.M., F.R.C.S., F.R.F.P.S.
Regius Professor of Surgery, University of Glasgow

Carcinoma of the pancreas is properly regarded as one of the most malignant of neoplasms. Until 1935, apart from occasional attempts on the part of a few adventurous surgeons, it was regarded as completely incurable. In that year, however, Whipple and his colleagues showed that radical extirpation of the head of the pancreas was a feasible proposition, and the hope was raised that surgery here, as in more accessible organs, might prove effective. Since then many surgeons have gained experience of the radical operation, and a number of reports have been published on which to base an estimate of the risks involved and the results to be expected. The time is now ripe, therefore, for a full assessment of the position.

CLINICAL FEATURES

As in other forms of malignancy, one of the keys to successful treatment lies in early diagnosis. It is therefore all the more disappointing that at the present time only a small proportion of cases reach hospital at a stage where radical treatment can be entertained To some extent this state is and always must be unavoidable, for many a growth is unresectable at the time of appearance of the first symptom, but in some cases delay still results from diagnostic mistakes. Perhaps faulty teaching in the past has been partially responsible, with its insistence on painless jaundice as the main feature It has, of course, been well known for many years that pain is a common early feature, and it is generally said to occur in 50 per cent of cases. This belief has recently been confirmed by Rob and Smith (1954). In their series of 184 cases pain was the first symptom in nearly 60 per cent It is generally of an aching character, often apt to be treated as a digestive disturbance, but may occasionally be severe enough to suggest biliary colic

Jaundice due to carcinoma of the pancreas typically is insidious in origin, progressive in course and ultimately of deep intensity. It is remarkable that the obstruction to the flow of such a thin watery fluid as bile should be so complete and permanent, especially considering that in autopsy specimens a probe readily traverses the stricture. In some cases, and particularly with an ulcerating ampullary growth, the jaundice intermits, probably owing to variations in the size of the growth due to oedema or inflammatory change In such cases, when the jaundice varies in depth or disappears for a period, the symptoms may be mistaken for a stone in the common duct or even for hepatitis In the later stages, the jaundice of malignant obstruction is of a deep olive-green hue and usually unmistakable.

Two other clinical features are sufficiently common to be worthy of note, especially as they are most characteristic of the operable ampullary growths The first is early pruritus, which may precede the visible appearance of jaundice by several weeks. In an elderly person, itching without obvious dermatological cause should call for an estimation of the bilirubin level. The second feature is cholangitis, due to infection of the bile passages from the ulcerating growth Sometimes pyrexial attacks may give the first evidence of disease, before the appearance of jaundice Usually the pyrexia is slight and ephemeral, but occasionally it is more marked, with chills and rigors. In such cases there is a risk that the cholangitis will be attributed to a stone in the duct.

DIAGNOSIS

Clinical examination

While Courvoisier's dictum is as accurate now as when he enunciated it, recent reports have underlined the evident truth that the clinical interpretation is liable to error. In a jaundiced patient distension of the gall-bladder almost invariably signifies malignant obstruction, but in a stout patient with a large liver the gall-bladder may be out of reach of the examiner's hand; negative findings are therefore of no value.

Radiological examination

Radiologists with a particular interest in the subject claim that even at an early stage it is sometimes possible to obtain radiological evidence of pancreatic carcinoma, particularly an ulcerating growth at the ampulla, which, after a barium meal, may show a filling defect or changes in the mucosal pattern. Later there may be expansion of the duodenal curve or evidence of duodenal obstruction. These are, however, inoperable cases and in general the results of radiological examination by barium meal are disappointing

Cholecystography also is usually disappointing, for the obvious reason that the liver which cannot secrete bile cannot secrete the opaque dye Occasionally, however, in an early case in which the obstruction is not yet complete enough dye is secreted to demonstrate the distended gall-bladder, while in similar cases Biligrafin may outline a distended common duct.

Recently the method of trans-hepatic cholangiography was introduced, in which opaque dye is introduced by percutaneous injection into one of the major hepatic ducts. However, it has proved too dangerous a method for general use. A straight

in the jaundiced patient

Special tests

It has long been recognized that these pancreatic function tests which aim to measure the digestive activities of the pancreatic enzymes are unreliable, due perhaps to the fact that some secretion reaches the intestine by way of the accessory duct of Santorini.

The liver-function tests also have proved disappointing. Recent observations indicate that of the many tests that have been employed, the thymol turbidity test and the estimation of the serum alkaline phosphatase are the most reliable, but on the whole the results are not sufficiently consistent to be used as the basis for a final diagnosis.

Tests for faecal occult blood, on the other hand, have been shown to be more valuable (Miller and his colleagues, 1951). They are especially useful, naturally, with ulcerating carcinoma at the ampulla, which may give a positive test in 75 per cent of cases (Rob and Smith, 1954). A negative result carries no significance.

Diagnosis at operation

an accurate diagnosis is sometimes
ollective investigation of Fraser
iatively for supposed malignant
disease proved in the outcome to be benign

The main difficulty concerns cases with a small lump deep in the head of the pancreas, and the problem here is to diagnose an early carcinoma from a focus of chronic pancreatitis or from the induration surrounding a small stone. Less commonly,

difficulty arises where the whole pancreas is indurated, and the diagnosis lies between an infiltrating carcinoma and diffuse pancreatitis.

In other situations an easy solution lies in a biopsy with immediate frozen sections, but in the pancreas experience shows this method to be unreliable and not free from risk, for if too little tissue is removed the tumour may be missed, while if too much is taken a pancreatic fistula is apt to form.

Exposure.—The first step, as has long been recognized, is to gain adequate mobilization, so that the pancreatic head can be inspected back and front and palpated carefully between the fingers and thumb. At this stage the supraduodenal part of the common duct can be opened, and a probe introduced downwards into the duodenum; a Lister's bougie is admirable for this purpose. It is then possible to feel the precise site of the duodenal papilla and locate any lump with reference to the ampulla. If further exposure is required, the second part of the duodenum is now opened, so that the papilla can be inspected directly, and, if necessary, incised sufficiently to visualize the ampulla. This trans-duodenal exposure must be performed gently and repaired with meticulous care for the duodenal wall is thin and unprotected by peritoneum, thus creating a considerable risk of leakage with the formation of a dangerous duodenal fistula.

ASSESSMENT OF OPERABILITY

Apart from distant metastases or wide local extension a decision as to operability depends upon the site of onset of the growth. The bounds of operability are overstepped (1) when the growth infiltrates the body and tail and (2) when the great veins are involved.

Infiltration of the body and the tail; involvement of veins

Infiltration of the body and the tail is indeed a common finding in otherwise operable cases. It is difficult to assess exactly because all cases with obstruction of the pancreatic duct present some degree of induration of the whole length of the organ. It is practically never operable and will not be further considered.

Involvement of the great veins (the superior mesenteric vein and portal vein) may occur as they pass deep to the neck of the pancreas. Gross involvement of this type may be indicated by congestion and venous dilatation in the portal field. Lesser degrees should be excluded by careful dissection of the veins from above and below the pancreas before it is decided to proceed.

Carcinoma of the head of the pancreas

In the head of the pancreas, modern experience brings new emphasis to [illegible]tance of distinguishing the following types:

Ampullary carcinoma

This includes growths arising on the duodenal aspect of the Vaterine [illegible] in the ampulla and related terminal portions of the bile and pancreatic d[illegible] individual variations exist, growths of this class tend on the whole [illegible] development and late spread. Moreover, in view of their relations[illegible] passages they tend to give rise to symptoms at a relatively early [illegible] admittedly the symptoms are sometimes atypical. Consequently, [illegible] prove to be resectable in a considerable proportion of cases, the [illegible] is not excessive and in patients who survive the operation there is [illegible] a permanent cure. Thus Cattell and Pyrtek (1949) had 1 operative [illegible]

and a five-year cure was obtained in 3 of the 12 cases who could be traced at the time of follow-up examination. In the experience of Waugh and his colleagues (Miller and his colleagues, 1951) from the Mayo Clinic, in 17 cases there were 2 operation deaths and 7 cases were alive and well after intervals of from 1 to 5 years. Similar results have been presented by Glenn and Hays (1954).

Carcinoma of the pancreas proper

This type includes growths arising from the parenchyma of the head of the pancreas at a distance from the ampulla. In this situation the outlook is much less promising, and as a result of extended experience the optimism engendered by technical advances has now given way to disappointment. Carcinoma of the pancreas in its early stages is symptomless, and as a rule clinical features appear only when it invades surrounding tissues or implicates the bile passages. Consequently, in growths originating at a distance from the ampulla, by the time symptoms have appeared the disease is generally far advanced, sometimes with local extension beyond possibility of removal, sometimes with metastases in the liver. Surgical experience, therefore, is of a high initial mortality and poor end-results In Cattell's series of 30 cases, for example, the operation mortality was nearly 20 per cent and among those followed up the average period of survival was less than a year.

In view of such a gloomy prognosis it is indeed questionable whether the radical operation should still be used in growths of this type, and there is a good deal of force in the argument that the operation of choice, even in "resectable" cases, is some form of palliative short circuit.

SURGICAL TREATMENT

Techniques of radical resection

Every surgeon in this field has his own techniques, and the method described here is recommended merely as one which has proved on experience to be relatively simple and satisfactory. The portion removed includes the head and neck and uncinate process of the pancreas, the whole duodenum, and portions of the stomach and proximal jejunum (Fig. 139). In the reconstruction, the jejunum is brought behind the mesentery and upwards into the operative field, following exactly the track of the excised duodenum. The stump of the pancreas is inserted into the open end of the jejunum. The common duct is inserted, end-to-side, a couple of inches further distal. The end of the stomach is anastomosed to the side of the jejunum still further distally (Fig. 140). This method has the advantage that the pancreatic and biliary ducts are inserted into what is, in effect, an intestinal *cul-de-sac*, so that if leakage of bile or pancreatic juice occurs the fistula is a "clean" one without admixture of food contents. Such a fistula does, in fact, occur quite often, but it causes little trouble and sooner or later closes spontaneously, while in the meantime as the food canal is not involved the patient's nutrition does not suffer.

The following technical points require discussion in some detail.

(1) The pyloric part of the stomach is mobilized by dividing the gastro-colic omentum. This dissection continued to the right frees the second part of the duodenum. The third part is sponged free from its retroperitoneal bed. At this stage the proximal jejunum is exposed and freed by dividing its peritoneal reflection and the underlying ligament of Treitz.

(2) The common duct and the gastro-duodenal artery are divided and the upper margin of the pancreas cleared.

(3) The superior mesenteric vein is traced upwards and the portal vein downwards behind the neck of the pancreas, their several thin-walled tributaries being divided

(4) The stomach is divided two or three inches proximal to the pylorus (unless, as is rare, the gastric acidity is high, there is no need to go further proximal); the jejunum

is divided three or four inches from its upper end. The first jejunal artery and the inferior pancreatico-duodenal artery are divided.

(5) The pancreas is cut through at its neck, or further to the left (Fig. 139). Quite a small remnant of pancreas suffices for insulin production. The stump should be cleared for at least one centimetre *so that it can be inserted neatly into the jejunum.*

(6) The uncinate process is dissected out from behind the great veins. This is one of the most troublesome steps of the operation, owing to the presence of several



FIG. 139 —The head of the pancreas along with the whole duodenum and the pyloric end of the stomach have been removed. The jejunum has been brought behind the mesenteric vessels and up into the operation field.

veins which drain from the process directly into the great veins. Sometimes also there are anomalous pancreatico-duodenal arteries arising from the superior mesenteric artery

(7) It is better to insert the full thickness of the stump of pancreas rather than implant the duct (Fig 140) Two continuous silk sutures are used. The first apposes the jejunal mucosa to the rim of the cut surface of the pancreas The second, as a kind of Lembert stitch, apposes the serous coat to the outer surface of the pancreas to give an ink-well infold. Great care is necessary in applying these stitches.

(8) *Since the common duct is always dilated it can be implanted into the* jejunum by the usual suture technique, using fine silk. This is preferable to using a Vitallium tube.

(9) The gastro-jejunal anastomosis is made in the ordinary way, end-to-side.

(10) A rubber drain should always be inserted to the vicinity of the bile and pancreatic implants, as leakage is common.

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Fig 139 —The head of the pancreas along with the whole duodenum and the pyloric end of the stomach have been removed. The jejunum has been brought behind the mesenteric vessels and up into the operation field.

veins which drain from the process directly into the great veins. Sometimes also there are anomalous pancreatico-duodenal arteries arising from the superior mesenteric artery

(7) It is better to insert the full thickness of the stump of pancreas rather than implant the duct (Fig 140). Two continuous silk sutures are used. The first apposes the jejunal mucosa to the rim of the cut surface of the pancreas. The second, as a kind of Lembert stitch, apposes the serous coat to the outer surface of the pancreas to give an ink-well infold. Great care is necessary in applying these stitches.

(8) Since the common duct is always dilated it can be implanted into the jejunum by the usual suture technique, using fine silk. This is preferable to using a Vitallium tube.

(9) The gastro-jejunal anastomosis is made in the ordinary way, end-to-side.

(10) A rubber drain should always be inserted to the vicinity of the bile and pancreatic implants, as leakage is common.

Conservative resection of the pancreas

Halsted, in 1898, in his original operation for a small ampullary carcinoma, carried out a conservative resection which included a wedge of tissue from the head of the pancreas along with a short cylinder of the second part of the duodenum. This type of operation is still occasionally advised for early growths at the ampulla, but there is little to recommend it. A limited resection of this type cannot be relied upon to include a sufficient zone of healthy tissue even in the smallest of growths, and it is precisely in that type of case that wide resection, with its offer of a permanent cure, is most desirable. Moreover, it is doubtful if the method offers any great advantage in point of technical ease or safety. The conservative resection is not a simple operation to perform. Even though the duodenum has been fully mobilized, there is a good deal of bleeding from the cut ends and from the wedge of pancreas, while in addition the depths of the wound are obscured by bile and pancreatic juice. The end-to-end suture of the duodenum is not easy, and in addition there is the implication of the

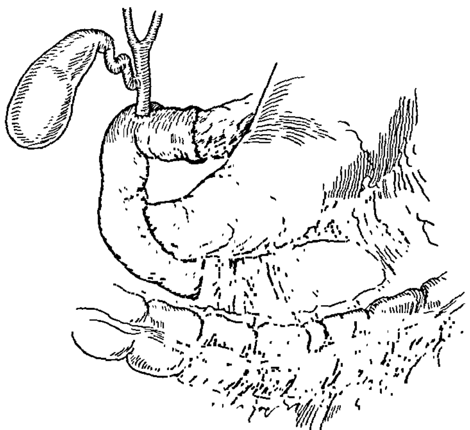


FIG. 140.—The reconstruction. The stump of the pancreas is inserted into the open end of the jejunum. The common duct and the stomach are implanted end-to-side more distally.

two ducts, which may be a matter of great difficulty. In contrast, in the type of case under discussion where the growth is of small size, the radical operation though long and tedious presents no serious difficulty for it is a clean dissection through normal tissues.

Palliative operation

While in recent years more attention has been devoted to radical surgery there still remains a considerable field of usefulness for palliative procedures which, by relieving

the jaundice, put an end to the almost intolerable pruritus and in some cases lead to an improvement in the lassitude and mental depression of the icteric patient. Although by no means free from risk—they carry an operation mortality estimated at from 10 to 20 per cent—such short-circuiting procedures are fully justifiable in suitable cases.

Before deciding on a short-circuit procedure it is necessary to satisfy oneself on two points, first, that the expectation of life is such that it is worth doing; and secondly, that the anastomosis will, in fact, relieve the biliary obstruction. This second point hinges upon the extent of the growth relative to the cystic duct, for it will be evident that if the cystic duct enters the common duct at a low point it may become involved in the growth, and a gall-bladder anastomosis will then fail to give relief.

As to the type of short circuit, in the past a cholecysto-gastrostomy was most favoured, owing to its ease of execution, but it is often followed by bilious vomiting There is said also to be a risk of ascending cholangitis, but with antibiotic treatment this is less serious than formerly. At the present time the method usually to be preferred is a cholecysto-jejunostomy The most satisfactory procedure is to perform a Roux-Y anastomosis, leaving a blind end at least eight inches in length, which is brought up either in front of or behind the colon and anastomosed to the fundus of the gall-bladder.

(*See also British Surgical Practice* Pancreas, Vol. 6, page 433; S Key 257.)

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DEVELOPMENTS IN THE LAW IN RELATION TO SURGERY

By DENNIS BARKER, M.A.
OF THE MIDDLE TEMPLE AND THE MIDLAND CIRCUIT, BARRISTER AT LAW
AND
WALTER MONTAGUE LEVITT, M D., F.R.C.P.
OF LINCOLN'S INN AND FORMERLY OF THE OXFORD CIRCUIT, BARRISTER AT LAW

CONSENT TO OPERATIONS AND CRIMINAL LIABILITY

It has been settled law since the days of Sir Edward Coke in the seventeenth century that a surgeon who performs an operation causing serious bodily harm where there is no just surgical cause for it commits a criminal offence, even if the person on whom the operation is performed consents to, and indeed instigates, its performance. Thus, in 1604, a man persuaded his companion to cut off his left hand so that he might avoid work and be able the better to beg, and both were found guilty of a criminal offence The reason for this principle was given in 1882 by Mr. Justice Stephen in the case of *Reg* v *Coney*[1] where he stated that "the consent of the person who sustains the injury is no defence to the person who inflicts the injury, if the injury is of such a nature or is inflicted under such circumstances that its infliction is injurious to the public as well as to the person injured".

Sterilization

The question as to whether the performance of an operation of sterilization constitutes such a criminal offence was discussed in 1954 by the Court of Appeal in the case of *Bravery* v. *Bravery*.[2] This was a case where a wife had petitioned for divorce on the grounds of cruelty, one of her main allegations being that her husband had [illegible]

Lord Justice Denning, in a dissenting judgment, considered that such [illegible] is lawful if performed for a good surgical cause, for example, to prevent the transmission of an hereditary disease, in the same way that an operation for abortion is lawful if it is carried out to save the life of the patient. But he held that if, as in Bravery's case, the sterilization operation is performed with the sole purpose of [illegible] to indulge in the carnal pleasure of sexual intercourse without [illegible], it is plainly injurious to the public interest [illegible] of the patient. [illegible] that generally accepted hitherto, but it did not commend itself to the other members of the Court who were, however, at pains to point out, as was the fact, that it was not necessary for them to come to any concluded opinion on the matter. Nevertheless, despite this caveat, they went out of their way to disagree with Lord Justice Denning's strongly expressed views upon the

[1] *Reg* v. *Coney* (1882), 8 Q B D 539.
[2] *Bravery* v. *Bravery* (1954), 1 W.L.R. 1170

illegality of the operation. They held that the dictum of Mr. Justice Stephen in *Reg* v. *Coney* was wholly inapplicable to sterilization operations as such, and they were not prepared to regard such operations as being injurious to the public interest, or illegal.

It is perhaps legitimate to speculate as to whether the majority view was not influenced to some extent by the present widespread and legal use of contraceptives. Once it is recognized as lawful to use temporary measures to avoid procreation, it is no great step to hold that it is lawful to adopt permanent measures At all events, there is now considerable support for the view that a sterilization operation is lawful provided the patient consents, though in order to avoid allegations of cruelty in divorce petitions such an operation should under no circumstances be undertaken unless the other spouse also consents.

THE LIABILITY OF HOSPITALS FOR NEGLIGENCE

Differentiation between professional and ministerial duties

It would seem to be a fair observation that the number of persons for whose negligence a hospital will be held liable increases as the years go by and has probably not ceased to expand.

The law has progressed far since the days of *Hillyer* v *St. Bartholomew's Hospital*[1] [illegible]

of Lords on the correctness of this decision, but it was not necessary for their Lordships to express a definite opinion upon the case one way or the other. The first major step towards a broader view came in 1942 when in the case of *Gold* v. *Essex County Council*[2] it was decided that a hospital was liable to a patient injured through the negligence of a radiographer who was a whole-time employee of the hospital This case is discussed at length in *British Surgical Practice* and it is not proposed to repeat those observations here The next step was taken in 1947 when in the case of *Collins* v. *Hertfordshire County Council*[3] Mr. Justice Hilbery held the hospital liable for the negligence of an unqualified house surgeon on its staff.

In 1951 in the important case of *Cassidy* v *Ministry of Health*[4] the opportunity was seized by the Court of Appeal to review all the relevant earlier decisions. In that case the patient entered a hospital suffering from a contraction of the third and fourth fingers of his left hand which his panel doctor had diagnosed as Dupuytren's contracture. This diagnosis was confirmed by the whole-time assistant medical officer of the hospital, who examined the patient on his admission and who recommended an operation, which he personally performed. After the operation, the patient's hand and lower arm were immobilized in a splint for about fourteen days, the patient being under the care of the assistant medical officer, the house surgeon and the hospital nursing staff During this period the patient kept complaining of severe pain but no action was taken to loosen the splint, and when the splint was eventually removed it was found that the hand was virtually useless. The contracture now involved not only the two fingers which had been operated on but had also affected the two good fingers, and despite two manipulative operations the condition proved to be irremediable The plaintiff sued the Ministry of Health (as being the responsible hospital authority) and the Minister joined the assistant medical officer as a third party. At the trial Mr Justice Streatfield gave judgment for the Minister on the ground that the

1 [illegible]
2 [illegible]
3 [illegible]
4 [illegible]

patient had failed to prove negligence on the part of any of the hospital staff and he therefore did not consider the position as between the hospital and the assistant medical officer.

The Court of Appeal allowed the patient's appeal from this decision, but the three judges were not unanimous in the method by which they arrived at their conclusions All three agreed that the doctrine of *res ipsa loquitur* applied and that consequently an explanation of the injury was called for from the hospital. It therefore became necessary for them to consider whether the hospital was liable for the negligence of all those in whose care the patient had been; for, if the hospital could either give a satisfactory explanation which displaced the onus of proof cast upon it or show that though there was negligence in the post-operative treatment, it was the negligence of a person for whom it was not responsible, it could escape liability altogether.

Terms of contracts for professional services

Lord Justice Somervell (as he then was) decided that the hospital was liable for the negligence not only of the nursing staff but also of the assistant medical officer and the house surgeon on the ground that they were employed as part of the permanent staff of the hospital and had contracts of service with the hospital and not contracts for services, thus applying the test laid down by Lord Goddard in Gold's case. What makes this ground of decision somewhat unsatisfactory is the difficulty of drawing the line between the two types of contract

Lord Justice Somervell recognized the fact that a person may be vicariously liable for the negligence of his servant even where that servant has to do work of a technical or skilful character for which special qualifications are needed, and he deprecated the test which Mr. Justice Hilbery applied in *Collins* v. *Hertfordshire County Council*, namely that in a contract for services the master can order or require what is to be done while in a contract of service he can not only order or require what is to be done but how it shall be done: for as Lord Justice Somervell pointed out, this test would exclude many cases where the relationship of master and servant clearly exists. He was, however, unable to substitute any other workable test, being content to remark that one perhaps cannot get much beyond posing the question "Was his contract a contract of service within the meaning which an ordinary person would give to the words?" This test, it is submitted, is equally unsatisfactory, for it is doubtful whether the ordinary person attributes any meaning to the words "a contract of service" in contra-distinction to the words "a contract for services".

Lord Justice Singleton founded his judgment upon the reasoning of Lord Greene, M.R., in Gold's case where the Master of the Rolls said ". . . . The powers of the defendants (that is, the hospital) include a power of treating patients. . . . If they exercise that power, the obligation they undertake is an obligation to treat and they are liable if the persons employed by them to perform the obligation on their behalf act without due care". Lord Justice Singleton held that all the persons engaged in the [illegible] and therefore [illegible] ot the [illegible] "employed" in the limited sense of "employed under a contract of service".

It follows from the reasoning of both these Lords Justices, and indeed they so state, that a hospital will not be liable for the negligent acts of a consulting surgeon or a visiting physician; and this is so whether or not the hospital selected the surgeon or physician. This view is in line with the early decision of *Evans* v. *Liverpool Corporation*[1] and accords with the opinion expressed by Lord Greene in Gold's case.

Lord Justice Denning, however, took the view that despite the previous "hospital

[1] *Evans* v. *Liverpool Corporation* (1906), 1 K.B. 16.

cases" the Court was at liberty to consider the question on principle unhampered by earlier authorities. He considered that the proper question to be asked in each case is who employs the doctor or the surgeon—is it the patient or the hospital? If the patient himself selects and employs the doctor or surgeon, then clearly the hospital will not be liable for the negligence of either of them, as it does not employ them, but where it is the hospital which selects, employs and pays the doctor or surgeon then the hospital is liable for their negligent acts whether they are consultants or not. In Lord Justice Denning's view a hospital, when accepting a patient for treatment, is under a personal duty to use care, and it cannot divest itself of that responsibility by delegating the performance of it to some other person whether that person be under a contract of service or under a contract for services. On this reasoning, once it is established that the persons engaged in the care of the patient were selected by the hospital and not by the patient himself, it will not be necessary for a patient who is claiming damages against a hospital to show that his injuries were caused by the negligence of any particular individual or individuals. He will merely have to show that had the hospital given him proper treatment he would not have suffered the injuries which have in fact resulted.

It is too early to say whether or not this view expressed by Lord Justice Denning is the correct one His remarks in so far as they concern the liability of a hospital for the negligence of a consulting surgeon were not necessary for the decision in Cassidy's case and, as has been seen, were contrary to previously held opinions. Three years later, in the case of *Roe* v. *Ministry of Health*[1], Lord Justice Denning reiterated his views: but this restatement was also *obiter*; and though in Roe's case Lord Justice Somervell did admit that possibly the line he drew in Cassidy's case between contracts of service and contracts for services was not a very satisfactory one, it is clear that he at any rate has not departed from his previously held opinions. At the present moment, therefore, the better view probably is that a hospital is not liable for the negligence of a consulting surgeon or a visiting physician, though it is submitted that the way in which Lord Justice Denning would approach the problem is at once the most logical and the simplest to apply.

Recovery of damages from the servant by the hospital

One final question remains to be answered. If a hospital is successfully sued by a patient for the negligence of a servant for whom it is held responsible, is it a rule of law that the hospital can claim to be indemnified by that servant in respect of the damages it has had to pay out? Prior to 1952 it was widely assumed that this was the case; but the majority of the Court of Appeal in *Jones* v. *Manchester Corporation*[2] took a contrary view.

In Jones' case the patient was accepted by the hospital as a patient suffering from first degree burns on his face, and an operation was performed for the purpose of cleaning up the face. The person in charge of the operation was a house surgeon who had been qualified for two years and the person who acted as anaesthetist had been qualified for only five months. [illegible] anaesthetized with nitrous oxid[illegible] was administered by the anaesthetist. When the patient became unconscious the house surgeon found that the mask covered some parts of the face which had to be treated and thereupon the anaesthetist, with the agreement of the house surgeon, injected ten millilitres of thiopentone without allowing the patient to recover consciousness. The patient died The patient's widow sued both the hospital and the anaesthetist and the trial judge held that the anaesthetist was negligent in giving an excessive dose of thiopentone to an anaesthetized patient, and in giving it at that step. However, he

[1] *Roe* v. *Ministry of Health* (1954), 2 Q B. 66.
[2] *Jones* v. *Manchester Corporation* (1952), 2 Q.B 852.

ordered the hospital to indemnify the anaesthetist in respect of all damages and costs awarded against her, blaming the hospital entirely for putting a weapon like a barbiturate within the reach of a girl qualified for only five months—a course which, as the judge put it, was simply asking for trouble. The hospital appealed and contended that in fact the judge's decision should have been the other way, and that the anaesthetist should be compelled as a matter of law to indemnify it. The Court of Appeal, by a majority, dismissed this contention, though they pointed out that there was nothing to prevent an express stipulation being inserted in the contract of service to the effect that the servant should indemnify the hospital if the hospital were made liable for his or her negligence. They did not, however, consider that the hospital was solely to blame and apportioned the responsibility as to 20 per cent on the doctor and as to 80 per cent on the hospital

The position now is that, where a hospital's liability for negligence is purely vicarious, it will normally be able to obtain a complete indemnity against the servant in respect of whose negligence it has had to pay damages; but where, as in Jones' case, some degree of negligence can be attributed to the hospital itself, then the responsibility for damages will be apportioned as between the hospital and the servant. In any event, the granting of an indemnity is not a matter of right, but is entirely a matter for the discretion of the Court.

LIMITATION OF ACTIONS

Until 1954 actions for damages for personal injuries against public authorities or against any person acting in pursuance of the execution or intended execution of any Act of Parliament or of any public duty or authority had to be brought within one year. In *Nelson* v. *Cookson*[1] it had been held that an assistant medical officer of a hospital run by a county council acting under its statutory powers could avail himself of this shorter limitation period: and in 1954 in the cases of *Higgins* v. *N.W. Metropolitan Hospital Board*[2] and *Razzel* v. *Snowball*[3] a similar conclusion was reached as regards a part-time specialist and a consultant orthopaedic surgeon who performed operations in hospitals administered by hospital boards under the National Health Service Act, 1946.

As long ago as 1949, however, a Committee sitting under the chairmanship of [illegible] ...lation of this special [illegible] h [illegible] n [illegible] ...Act 1954, which came into force on 4th June ... [illegible] d [illegible] ...ons in several important respects. [illegible] ... Protection Act 1893 and section 21 of [illegible] ...eal being that henceforth the period of limitation for actions for negligence is the same for all persons, whether they are public authorities, or acting in pursuance of a statutory or public duty or not.

The Act further provides that in the case of actions for damages for negligence, where the damages claimed by the plaintiff for such negligence consist of or include damages in respect of personal injuries to any person, the period of limitation is to be three years (instead of six years as was previously the case).

It was necessary in view of this general shortening of the limitation period to enact certain transitional provisions, in order to prevent a person who had suffered personal injuries owing to the negligence of another more than three but less than six years before the passing of the Act, but who had not then commenced his action, from being

[1] *Nelson* v *Cookson* (1940), 1 K B 100
[2] *Higgins* v. *N W Metropolitan Hospital Board* (1954), 1 A.E.R. 414.
[3] *Razzel* v. *Snowball* (1954), 1 W L.R. 1382.

deprived of all remedy. Consequently the Act provides that the time for bringing proceedings in respect of a cause of action which arose before the passing of the Act shall, if it has not already expired, expire at the time when it would have expired apart from the provisions of the Act or at the time when it would have expired if all the provisions of the Act had at all material times been in force, whichever is the later. The result is that if a person suffered injuries through the negligence of a private individual in 1950, four years before the passing of the Act, he may rely on the provisions in force prior to the Act, namely section 2 of the Limitation Act 1939, by which the period of limitation for such actions was six years. If, on the other hand, he suffered his injuries through the negligence of a public authority eleven months before the passing of the Act he may rely upon the Act and will still have another two years and one month in which to begin his action.

The Act has also altered the effect of death upon rights of action It provides that actions brought under Lord Campbell's Act (the Fatal Accidents Act 1846) in respect of the death of a person must now be commenced within three years after the death of the deceased person instead of twelve months as was previously the case. Moreover the provision in the Law Reform (Miscellaneous Provisions) Act 1934 by which actions which survive against the estate of a deceased person are not to be maintainable unless the cause of action arose not earlier than six months before the death of the deceased person is repealed, the effect being that if a surgeon dies, an action may be brought against his estate by a person claiming damages for personal injuries caused by the surgeon's negligence at any time within three years from the date of the injuries.

(*See also British Surgical Practice* Law in Relation to Surgery, Vol 5, p 375, S Key 217.)

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EARLY AMBULATION IN THE POST-OPERATIVE MANAGEMENT OF GENERAL SURGICAL PATIENTS

By J. R. F. MILLS, M.D., M.S., F.R.C.S.

SURGEON, TORONTO GENERAL HOSPITAL; ASSISTANT PROFESSOR OF SURGERY, UNIVERSITY OF TORONTO; CONSULTANT IN SURGERY, SUNNYBROOK HOSPITAL, D.V.A.

To Emil Ries of Chicago must go the credit for having brought before the medical profession the subject of early ambulation following operation Writing in the *Journal of the American Medical Association* in 1899 he stated: "The purpose of these changes (early ambulation) has been to free patients from many irksome and disabling features of after-treatment as usually carried out, and at the same time to make their recovery more rapid and more complete so that they are able to leave the hospital at a much earlier date than has been customary, and in such condition of strength that they can follow their wonted occupation within a few days after their discharge from hospital." In spite of these commendable features very little interest was shown in the subject until 1941 and very little appeared in the literature. In that year Leithauser and Bergo reported on the effect of early post-operative rising in 436 cases. Since that time many papers have been written giving its advantages and limitations.

It is of interest that Dr. Ephraim McDowell, who performed the first successful laparotomy in the United States of America in 1809, found his patient up and making her bed on the fifth post-operative day.

DEFINITION

Early ambulation conveys a somewhat different meaning depending on the practice of the person who is using it. Some carry it to the extreme whereby when a patient is operated on under ... to his room from the operating table. T... of the procedure usually mean getting ... return from the operating room when he has recovered from the narcosis. This performance may be ag... The terms that are in ... is. ... day.

Most practising surgeons feel that to get the ... day that he has undergone major surgery is carrying the procedure to an extreme without having regard to the patient's comfort. A common practice is to allow the patient out of bed on the same day as his operation if he desires, and if difficulty with micturition is anticipated he is usually got out of bed on the same day in an attempt to avoid catheterization; however, on his first post-operative day he is encouraged to get up, and practically all patients are out of bed in 48 hours unless there is some clear contra-indication.

It is indeed a far cry from the day when the patient who had undergone repair of an inguinal hernia was kept in bed for 2–2½ weeks, whereas he now arises on the same

day as his operation Unless the attending surgeon has given explicit orders to the contrary, "getting the patient up" often means that he is merely transported from his bed to a nearby chair. This is not early ambulation, and is, in fact, defeating the purpose for which the procedure was intended. By having the patient sit in a chair with the knees flexed, the blood tends to pool in the veins of the pelvis and calves due to the obstruction at the groins and popliteal fossae, and this is, of course, a predisposing factor in thrombosis. It would be very much in the best interest of such a patient if he were allowed to be flat in bed and to carry out muscular exercises of his lower extremities in preference to getting up and sitting in a chair.

GENERAL PHYSIOLOGICAL PRINCIPLES AND THEIR SPECIFIC RELATIONSHIP TO CERTAIN ASPECTS OF EARLY AMBULATION

Nutrition

Pre-operative activity and nutrition

For the patient who is about to undergo major elective surgery many measures can be taken to improve his general condition not only from the point of view of helping him during the operation but also to make his post-operative convalescence more smooth Obviously, in many acute cases, time does not permit these measures to be carried out

Operations upon the obese patient are technically more difficult and carry an increased hazard of infection, and wound healing may be delayed. In many of these cases, when operation is not urgent, it would be wise to delay surgery for a few weeks and put the patient on a weight-reducing diet, the much smoother convalescence and greater freedom from complications are ample justification for the delay. Blood transfusions and a high protein diet, and, if necessary, iron pre-operatively will help to correct many deficiencies which are associated with a severe degree of anaemia

Many patients who are to undergo operation have some degree of cardiac decompensation or irregularities of rate and rhythm It is essential that these be brought under control by means of various drugs as well as restriction of fluid and salt. Many grossly irregular hearts can be brought under control and the rhythm may also be restored to normal.

It is also very much to the patient's advantage that, when possible, he be allowed to partake in normal physical activity prior to operation. Whenever the help of a physiotherapist is available the patient should be instructed in performing general physical and breathing exercises. Even without this skilled instruction he must be encouraged to aim at the same objective. This undoubtedly makes early ambulation much more easy and makes return to normal physical activity post-operatively much more rapid When patients are confined to bed pre-operatively there is atrophy of the skeletal muscles with stagnation of blood in the deep veins as well as sluggish intestinal function and often urinary difficulties. These factors produce conditions which are the opposite to those for which we are striving; hence it is desirable, when possible, to have the patient ambulatory before he undergoes major surgery.

Post-operative nutrition and nitrogen balance

During the immediate post-operative period there is a negative nitrogen balance, and there is quite a wide variation in the amount of nitrogen lost. This loss was once attributed to the restricted food intake combined with the general physiological disturbances which accompany any major surgical procedure. The phenomenon is now known to be the result of adrenal cortical control of nitrogen metabolism. It has also been demonstrated that if normal healthy adults are put to bed they likewise go into a negative nitrogen balance, but when they get up and become active it becomes positive Peters (1944) has pointed out the fact that a healthy person if

subjected to an infection or injury suffers protein depletion that cannot be prevented by any dietary measures now known. However, even a malnourished person appears to have the ability to summon into action certain conservation processes that allow him to make use of protein for formation of tissues.

From the point of view of the clinician, *the important factor* in increasing the breakdown of proteins post-operatively would appear to be the magnitude of the operation and the trauma attendant upon it, as well as the length of time the patient is confined to bed Both of these factors can be *greatly influenced* by the surgeon. Careful technique, rigid asepsis, and prevention of blood loss will decrease the ill effects of operation, and early ambulation of the patient will become an important factor in the control of this aspect of metabolism. Early *return to a normal food* intake helps to prevent further nitrogen loss. This is made more likely in the patient who is ambulant early and who is being managed on physiological lines.

Early ambulation is an important factor in reducing the nitrogen loss both directly and indirectly by increasing the patient's appetite and general sense of well-being so *that the food intake is early restored to* normal.

Cardiovascular system

Haemoconcentration

Immediately any patient is subjected to the trauma of a surgical procedure certain local and other more widespread changes occur in the vascular system. Locally there is the reaction of inflammation which causes the arterioles, venules and capillaries to dilate. More remotely the vessels become constricted and hence there is a slowing of *the flow of blood through this area The walls of the capillaries undergo changes* which increase their permeability and there is a flow of plasma through the wall of the vessel, leading to haemoconcentration. There is also an increase in fibrinogen, an *increased sedimentation rate, destruction of red blood cells, and other changes which* favour the development of thrombosis within the deep veins, particularly of the leg. These may become the source of pulmonary emboli.

Stagnation of venous blood

Frimann-Dahl (quoted by Bellis, 1950) demonstrated radiographically that the venous return from the lower extremities is retarded after an abdominal operation, a fact which was attributed to abdominal distension and inactivity. Smith, Allen and Craig (1940) showed that exercise and elevation of the lower extremities increased the flow of blood in the inferior vena cava by 250 per cent. Realizing that the most important single cause of thrombophlebitis, phlebothrombosis and pulmonary embolism is retarded venous circulation in the lower extremities, Bellis (1947–1948) pointed out that *the venous return from the lower extremities is impeded by intestinal* distension and that almost no venous return could be demonstrated with the patient in Fowler's position. Under these circumstances he was able to prove that elevation *of the lower extremities* or vigorous movement of the feet impelled the blood towards the heart. It has been shown that Diadrast may remain in the deep veins of the leg for fifteen minutes, when there i "shunted
upward" with any movement of
Bellis, 1950), demonstrated that
in the *standing-still position. In the person* who is walking venous blood is being propelled toward the heart. In the sitting or standing patient blood is stagnant in the lower extremities—ideal conditions for the production of *thrombosis. During the* 14 to 16 days after an abdominal operation it is less dangerous to enforce recumbency than to permit sitting or standing still.

Muscular exercises

The greatly increased flow of blood which occurs with muscular exercise tends to prevent clotting and any elements which aid in the production of clotting and which

have been produced during the operative and immediate post-operative period are washed away.

Posture

Prior to the time when it is possible to get the patient out of bed, the foot of the bed should be elevated in order to facilitate the return of blood from the lower extremities. In addition, the patient should be encouraged to move the lower extremities, starting with movement of the toes and ankles, as another factor in aiding the return of blood to the heart.

Ambulation

On theoretical and physiological grounds early ambulation would seem to be the answer, in large part at least, to post-operative thrombosis and its sequelae. The clinical results, however, do not seem to be completely in accord with the high hopes that were entertained. There appear to be different impressions as to the effect of early ambulation in phlebothrombosis and pulmonary embolism.

Keyes (1947) and Bellis (1950) maintain that the incidence of embolic phenomena is almost eliminated with this regimen The figures given by Todd and Massie (1951) indicate that the incidence of thrombophlebitis has not been reduced by early ambulation, however, the percentage of deaths due to pulmonary embolism in comparison to the total deaths shows a considerable reduction in the ambulatory group.

The evidence would seem to indicate that there has been some slight reduction in the incidence of emboli in patients who rise early, but it is not the whole answer to this serious complication.

Pulmonary system

In recumbency there is a decrease in vital capacity in the normal individual. McMichael and McGibbon (1939) have shown that in this position there is a decrease both in the total volume of air in the fully expanded lung and in the functional residual air. The decrease in the vital capacity has been variously estimated to be about 15 per cent.

The reflex inhibition of the muscles of respiration with a decrease in their tone and contractility is especially significant in post-operative illness. This is borne out by determination of vital capacity

Under ordinary conditions the respiratory muscles exert a pump-like action which aids venous flow from the lower portion of the body via the inferior vena cava. When its action is restricted the diaphragm is relaxed and it occupies a high position, thus reducing the pulmonary capacity. The result is shallow respiration with a decrease in pulmonary ventilation which contributes to the development of anoxaemia and other changes in the blood. The reduced activity of the muscles of respiration is also a factor in the collection and retention of bronchial secretion which is usually stimulated to excess after operation. With production of excess secretion and a narrowing of the lumen of the bronchial tubule the lumen may be completely filled with mucus. According to Hilding (1944) with movement of this mucous mass by ciliary action, air is removed
of the individu
or even lung
Because the cc
serious proportions before it is detected clinically. Following an operation there is
ichioles, also a reflex inhibition
vital capacity. If measures are
process and to restore normal
function it may progress as just described and result in serious or occasionally fatal consequences.

Measures which help to restore the vital capacity to normal, restore the cough reflex, and increase the range of excursion of the respiratory muscles will all be helpful in restoring the patient to normal.

The clinician must take measures to re-establish the cough reflex quickly once the patient returns from the operating room. Judicious use of sedatives, avoiding excessive sedation, is very important in this respect. The patient must be encouraged to take deep breaths and to cough A few minutes of the surgeon's time can be very valuably spent, prior to operation, explaining to the patient what is being done, telling him that he will experience a certain degree of discomfort but assuring him that nothing serious will happen to his incision. By placing one's hands on the patient's abdomen when he coughs the patient is given great reassurance and this will allow him to clear out his airway more effectively. The cough reflex is increased and mucus is expelled more readily. Rees and Coller (1943) maintain that there is a much lower incidence of pulmonary as well as other complications when transverse incisions are used in upper abdominal operations. Todd and Massie (1951) have reported that post-operative pneumonia has been reduced by 2 per cent and atelectasis by 1 per cent. The total reduction in pulmonary complications is about 3·3 per cent.

Gastro-intestinal system

The control of the gastro-intestinal musculature is regulated through the sympathetic and parasympathetic nervous systems. This control is rather complex and not fully understood There is some evidence to indicate that the basic mechanism is through the myenteric plexus and that this mechanism is capable of maintaining intestinal motility without direct regulation by the autonomic nervous system.

The trauma which is necessarily incurred at abdominal operations may be followed by varying degrees of post-operative distension. This can occasionally go on to the clinical condition of adynamic ileus.

The degree of distension [illegible] influenced to some degree by the amount of trauma that the surgeon causes at [illegible], pulling on the mesentery and [illegible] -operative abdominal distension, with the attending discomfort, nausea and vomiting, is in itself distressing to the patient and may become a very serious issue. *It may not only seriously impair the patient's proper biochemical balance* but it may also affect the other systems.

By exerting pressure on the great vessels of the extremities the return flow of blood from the lower extremities in particular is impeded By exerting pressure upward on the diaphragm respiratory movements are interfered with and the vital capacity may be lowered. The distension in the bowel itself may cause disturbance of the blood supply to the bowel and may seriously lessen the chance of healing of an anastomosis as well as causing disturbance of healing in the abdominal wound itself.

Gastric decompression is started immediately after operation by means of an indwelling naso-gastric tube which was previously put down into the stomach and either connected to Wangensteen suction or allowed to drain freely into a receptacle. In that way all of the trapped air in the stomach is disposed of; it is this ingested air which accounts for the major part of the gases in intestinal distension. While the naso-gastric tube is in place the patient is allowed to sip water and by so doing the throat is kept moist and the stomach is kept empty. Once he starts to pass flatus the tube is removed and gradually increasing amounts of fluid and solid food are given by mouth Until such time as he is able to take enough by mouth he is given water [illegible] fluids which contain adequate amounts [illegible] When the patient is ambulatory

Early ambulation directly aids gastro-intestinal function by encouraging an earlier return to normal function of the gastro-intestinal tract, and it has been found, clinically, that once patients get out of bed and walk around the majority of them have less gas pains and start to pass flatus earlier. By decreasing abdominal distension the return of blood from the lower extremities is assisted; it also aids respiration by minimizing the upward pressure on the diaphragm.

Genito-urinary system

Most ambulant patients are able to micturate but often, when confined to bed and faced with the problem of using a bed pan, they are unable to do so.

Post-operative catheterization is a procedure which, besides being uncomfortable to the patient, is attended by a fairly high rate of infection of the lower urinary tract when the procedure has to be repeated on several occasions. Even when the patient has to be catheterized only once the incidence of complications is high. This may result in as serious a condition as the one for which the operation was performed. The need for catheterization can be markedly reduced if the patient gets out of bed prior to the time that catheterization would be necessary Because the catheterizations are reduced the occurrence of cystitis is also appreciably lowered.

The wound

Necessity for special incision

Many writers have stressed the importance of the use of anatomic incisions as an adjunct in early rising The use of rectus displacing incisions has been cited as a contra-indication to getting patients out of bed early

It has been the practice at the Toronto General Hospital to use the McBurney split muscle incision for practically all appendicectomies and on a few occasions for procedures such as a rod colostomy For gastrectomies and gall-bladder operations a left or right paramedian muscle displacing incision has been used almost routinely The transverse incisions have been used in a few cases of pancreatic and colon resections but an appreciable difference in wound healing or post-operative discomfort has not been noted

There does not appear to be any valid reason for condemning any of the standard incisions that are now employed in so far as early rising is concerned Vaughn, Guzauskas and Metzner (1950) have advocated all of the standard incisions for use in abdominal procedures Bauer (1941) has recommended the use of the transverse incisions in most operations and feels that the midline incision is preferable to the mid-rectus In general, it appears that the type of incision need not depend upon whether the patient is to get out of bed early or not, but rather upon which gives the best exposure for the particular operation concerned. A careful closure performed without tension on the tissues would appear to give equally good results whether it be a rectus displacing incision or a transverse incision

Wound closure and suture material

When early ambulation was in its infancy one of the requisites in wound closure was the use of a non-absorbable suture Various types were used including silk, cotton and wire Leithauser (1946) has been insistent that catgut in itself is quite inadequate, and has used a combination of wire and catgut, and where there is any question of wound infection the catgut is not used Keyes (1947) and Vaughn, Guzauskas and Metzner (1950) have reported good results where catgut was used in all layers for the wound closure

Many other factors in wound closure are to be considered besides the type of suture material to be used Great care should be taken throughout the operation to reduce the possibility of wound infection to an absolute minimum Good relaxation

is essential. If there is any stretching or pulling of the suture the likelihoo the tissues is great, and if it occurs in the peritoneum or posterior rectus chance of an incisional hernia is increased. Where open bowel is being de wound is sealed off with sponges which are discarded as soon as the ana completed. Absolute haemostasis is a requisite, and only small bites of be taken in artery forceps. The following technique has been used by during the past five years.

Catgut sutures are used throughout except in the skin. No. 1 chromi used in the posterior rectus sheath and peritoneum. For upper abdomina when the patient is obese and there is considerable extraperitoneal fat, the and posterior rectus sheath are sewn up separately. The continuous sutur mented by interrupted vertical mattress sutures of No. 1 chromic catgut, being used in an average incision. The interrupted sutures are put in al continuous suture so that there is no possibility of cutting the continuou anterior sheath is closed in similar fashion. Janes (1954) has pointed o necessarily heavy sutures should be avoided. In general, it would seem to to use material of greater tensile strength than the tissue to be sutured.

Factors concerned in good healing and prevention of dehiscence and herniae

Much experimental work has been carried out on the rate of wound h

of a group of dogs exercised daily after operation with a similar group c fined. The conditions reproduced, as closely as was possible, those of patie post-operatively by rest in bed and early ambulation. Their conclusions f experiments was that the general condition of the ambulant animals was over that of the controls. Furthermore, a gain in weight was noted in a number of animals in the ambulant group while in general the controls lo The tensile strength of the post-operative abdominal wound in the ambul did not differ significantly from the values in the control group. Histolog difference could be found between the control group and the ambulant animals The process of fibroplasia was well advanced on the fourth post- day and fibroblasts were abundant throughout the several layers of tissue end of a two-week period the "scars" were well organized and vascularized. N (1943), conducting experiments on rats, was able to demonstrate that th strength of incisions in exercised animals reached a maximum in five days, the control group ten days were required before the same resistance to d was attained.

These experiments tend to prove that rest balanced with exercise rat absolute rest tends to hasten healing. These investigations emphasize that improves the circulation of fluids, thus aiding nutrition and accelerating th waste products away from the injured tissues. The metabolic rate is also i by exercise.

... to patients; the anir ... s other factors, su amount of trauma inflicted on the tissues at the ... operation, anaemia jaundice, hypoproteinaemia, hypovitaminosis, poor circulation and unknow in cancer patients must be taken into account. Healing is favoured in the of a good supply of oxygen, proper removal of waste products and a goo of blood and lymph; these result from a proper balance of rest and activity

Early ambulation, as a method of post-operative treatment, has often been of doubt in the minds of surgeons who naturally feared a disturbance in

out of bed soon after operation. Many reports indicate, however, that evisceration usually occurs in patients who are lying in bed and commonly during the period of 7–10 days following operation.

Most of the reports in the literature indicate that the incidence of evisceration in early ambulation is practically negligible, and that post-operative herniae are definitely less than when patients are allowed to stay in bed for longer periods.

In the treatment of herniae Shouldice (1954) has reported a recurrence rate of under 1 per cent when the herniae are treated under local anaesthesia and the patient is allowed to walk back from the operating room. Much more scepticism was voiced concerning early rising following the repair of direct herniae, but Blodgett and Beattie (1947) have shown a lower incidence of recurrence in direct herniae in early risers as compared with patients who have been kept in bed.

The anaesthetic

The ideal anaesthetic to be used where early ambulation is practised would, of course, be local or regional anaesthesia. This can be used very satisfactorily in the repair of herniae and the ligation of varicose veins, but its field of application is very limited.

Leithauser (1946) has advocated the use of spinal anaesthesia as the one of choice, but because of the development of headaches and other serious complications its routine use has fallen into disrepute in many centres.

The main requisite about an anaesthetic agent would appear to be that it affords good relaxation during the performance of the operation. Good relaxation means less trauma to the tissues which in turn means better wound healing. The closure of the abdominal wall is greatly facilitated if there is good relaxation of the abdominal musculature. Avoidance of tearing of the posterior sheath and peritoneum reduces the likelihood of incisional herniae.

General anaesthesia with good relaxation is very satisfactory and provided that the patient becomes conscious in two or three hours, does not delay getting him out of bed early in the post-operative period

The technique of early ambulation

The method of getting the patient out of bed is also important for the eventual success of the scheme. It is preferable to have at least two attendants present although it can be accomplished quite safely by one. The patient is helped to turn on his side and the bed is wound up to a sitting or semi-sitting position. The feet are assisted over the edge of the bed by the nurse or orderly and then with their help the patient sits on the side of the bed with the feet resting on a chair. The patient is then assisted to the floor and is allowed to stand for a very short period before he starts to walk around the bed and then return to the side from which he started. He is then helped back into bed and with each successive excursion the distance that he walks is increased

Early rising for the patient will be much more successful if the memory of the first occasion is not one of agonizing pain and discomfort, due to injudicious efforts by well-meaning but inadequately trained attendants. There are also some points about the abdominal dressings and extra-abdominal supports which will make the initial effort much more easy for him.

Many surgeons use only a vertical strip of adhesive to cover the abdominal incision in the case of mid-rectus incisions. It has been found that the use of several transverse pieces of adhesive over a suitable dressing of gauze, or gauze and abdominal pads, is preferable [illegible]
a great[illegible]
cases th[illegible]

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Contra-indications to early rising

In the field of general surgery, exclusive of fractures, there are certain limitations to the practice of early rising. In a small group of cases there are definite indications for more bed rest. The majority of clinicians recognize the following contra-indications and would be in agreement that any patient falling into this group would not be a candidate for early rising and that further bed rest, if not mandatory, is at least advisable. (1) Severe shock; (2) haemorrhage or fear of a haemorrhage; (3) prolonged bed rest prior to operation; (4) severe cardiac insufficiency; (5) recent coronary occlusion; (6) serious infection; (7) hypoproteinaemia; (8) severe anaemia; (9) certain features peculiar to an individual operation.

PSYCHOLOGICAL ASPECTS

The reaction of patients when confronted with the problem of early rising varies greatly Many are very anxious to try it and co-operate magnificently; others are very fearful of embarking on this seemingly venturesome innovation. Once their

first attempt they must have adequately trained assistants so that it does not end in failure. The feeling of relief because there is no need for a bed pan or a catheter makes most patients anxious to continue getting up even at the price of some discomfort. The majority of patients who follow this programme require less sedation, their general sense of well-being is enhanced, their asthenia is diminished and their morale generally is boosted

Before the patient will embark on this routine with enthusiasm, however, it is essential that the attending surgeon and nurses also shall be convinced that it has real merit

ECONOMIC FACTORS

In the present time of high hospital costs, and the difficulty in getting hospital beds, it is obvious that it is greatly to the patient's advantage to get around quickly. He is also able to return to work a little sooner so that his expenses are decreased and the family income is restarted earlier. In general, it has been found that for most major surgical procedures the time saved by this means amounts to four or five days per patient.

Early ambulation has been tested and appears to be an accepted procedure in the post-operative management of patients by most clinicians. If everyone is aware of its advantages as well as its shortcomings and contra-indications, the patients stand to benefit a great deal, without running any greater risk, and, in fact, often with a smaller risk of an undesirable complication.

(*See also British Surgical Practice* After-Care—Post-Operative, Vol. 1, page 130, S. Key 17)

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THE GENERAL PATHOLOGY OF REPAIR

By GEOFFREY HADFIELD, M.D., F.R.C.P., F.R.C.S.

Director of Clinico-Pathological Laboratories, Imperial Cancer Research Fund

INTRODUCTION

General biology of the repair process

It is a general rule that after loss of tissue the capacity to restore specific cellular structure, size, external form and internal design shows a progressive decline as we ascend the evolutionary scale. The simplest multicellular animals may regenerate the whole body after seven-eighths or more has been removed, this being associated with an ability to reproduce asexually The phenomenal powers of regeneration possessed by the starfish, for example, may be correlated with the fact that it is the most highly organized animal to reproduce itself asexually in the adult form.

On the other hand, successful regeneration is not always conditioned by structural simplicity. The crustacea and amphibia, for example, have retained the power to regenerate a perfect model of the lost part after loss of a limb, tail or claw, and such remarkable regenerative powers may obviously be correlated with the high survival value of the parts

The repair process after amputation of an amphibian limb has three phases:

(1) *A cellular multiplication phase* during which there is produced, at the end of the amputation stump, a regeneration bud or blastema composed of a mass of closely packed, undifferentiated, embryonic cells possessing great fertility. These arise by proliferation of local and previously undifferentiated cells, of others which become de-differentiated and of others which migrate into the blastema. There is remarkably little essential difference between this regeneration bud and the bud from which the same limb arose during normal embryological development.

(2) *A differentiation phase* when the blastema contains a series of differentiated cell masses each composed of one of the tissues—epidermis, muscle, bone or connective tissue—which is needed for the reconstruction of the limb.

(3) *A re-organization phase*, just as essential as the preceding phases, when the blastema becomes modelled into the specific form and internal design of the lost member by a series of complex movements of cells, cell masses and intercellular material as a result of which each component of the limb comes to lie in its appropriate position in relation to other components and to the limb axis.

Three fundamental principles are therefore illustrated in the process of regeneration of the amphibian limb First, its general pattern can be discerned during the processes of repair and regeneration in any vertebrate tissue Second, both amphibian regeneration and the process of repair have so much in common with the early development of the vertebrate embryo that all three processes may well be actuated by a similar or common stimulus Third, that in common with embryological development the fundamental characteristic of repair is the orderly re-arrangement of tissues brought about by a series of movements into position of cells in sheets and masses, together with their intercellular material—a process which Medawar has called the *tactics of regeneration*. Cellular multiplication and differentiation may be compared with the delivery of bricks on a building site, the complex process of

orientation by the mass movement of cells producing an organized structure comparable to a house. In normal wound healing tactical migration is responsible for the penetration of clot by capillary blood vessels, the accurate alignment of collagen fibre bundles and fibroblasts, and the epithelialization of granulation tissue surfaces.

Definitions

In human pathology the word healing is loosely used to indicate restoration of continuity. Repair is more concisely employed to describe the filling up by granulation tissue derived from local mesenchyme of a breach in an internal or external surface or a gap such as may be produced in a solid organ or between the ends of a broken bone, a severed muscle or a ruptured tendon The granulation tissue becomes transformed into mature collagenous connective tissue or bone and both are remodelled to take stress and strain

Regeneration by common usage implies that a loss of living cells is made good by proliferation of surviving cells specific to the tissue and having the same structure and function as those which were lost, connective tissue, lymph and blood vessels being provided by local mesenchyme.

These definitions are misleading. Mesenchymatous tissue being ubiquitous, it is generally impossible to injure any tissue without injuring mesenchyme, and with few exceptions the cells derived from mesenchyme retain, to an outstanding degree, their primitive capacity to proliferate vigorously and differentiate perfectly. The repair process, therefore, provides a clear example of vigorous but unilateral regeneration of an exceptionally fertile tissue, and the mass of collagenous scar so produced strongly tends to be excessive.

Repair—a biphasic process

A common general pattern can be discerned in all healing processes, the same series of purposeful events following each other in the same orderly sequence irrespective of the tissue involved or the nature of the injury. Furthermore, when viewed as a whole, the process is unalterably and invariably biphasic, an initial lag period of inflammation and demolition (the provisional phase) gradually merging into a definitive phase of true repair.

The lag period

This period paves the way for the phase of true repair which in uncomplicated injury remains in abeyance until the lag period is nearing its end If chronic infection or gross tissue injury be present, the two processes continue side by side, often for long periods. Traumatic inflammation is initiated and maintained by the presence in the injured area of vasodilator and positively chemotactic products of tissue injury.

The general metabolic response

A general metabolic response occurs during the lag period of the healing process, differing in no essential from that which is evoked whenever the integrity of the internal environment is threatened, and it is becoming impossible to escape the conclusion that a release of steroid hormones from the adrenal cortex is vitally concerned in its causation It is equally probable that the hormones of the "pituitary-adrenal axis" are also involved in the local process of true repair.

Investigation of sub-microscopic structure

We are approaching the time when the investigation of the sub-microscopic structure of repairing wounds is likely to produce vital information, the study of collagen by the electron microscope and x-ray crystallography being an obvious example.

THE PROVISIONAL PHASE OF HEALING

Emergency period

At the beginning of the provisional phase three emergencies are dealt with: (1) The *arrest of haemorrhage*; (2) *the* provision of a temporary seal composed of blood clot; and (3) the rapid establishment of a triple response in the area immediately surrounding the injury. Capillary haemorrhage is controlled by widespread, almost instantaneous and long-sustained obliterative capillary spasm, and haemorrhage from arterioles and arteries by *segmental spasm*, muscular retraction and intimal corrugation persisting long enough for thrombosis to obliterate the narrowed lumina. Thrombocytopenia, lack of vitamin K, a fall in the blood level of prothrombin or other abnormalities in the clotting mechanism will obviously hinder this process.

Haemostasis induces a *considerable degree of temporary ischaemia in the living* tissue in the depths and sides of wounds, and for a very short period its surviving cells are subjected to anoxia. This is *rapidly rectified by the establishment of a triple* response Dilatation of undamaged capillaries and free exudation of plasma cause hyperaemia and inflammatory oedema, and the edges of the wound become red and swollen This response is probably due to histamine release and is absent or minimal in tissues which, from previous injury, surgery, or irradiation, are scarred, relatively avascular and permanently damaged Such tissues are also likely to react ineffectively in the subsequent stage of traumatic inflammation.

Traumatic inflammation

The triple response insensibly merges into the phase of traumatic inflammation which, in moderate injuries, lasts for about five to eight days and is indefinitely prolonged if complicated by arterial ischaemia or infection. It has the same general pattern as all acute inflammations, takes place irrespective of bacterial infection, and is an essential consequence of any injury which produces tissue death. The arteriolar and capillary dilatation with free exudation of plasma is followed by leucocytic emigration, and a little later by dilatation of pre-existing lymphatics and lymphatic capillaries The cellular exudate is at first composed of haemal leucocytes (microphages), followed by increasing numbers of tissue phagocytes (histiocytes or macrophages) This familiar microphage ⟶ macrophage succession must be ascribed to metabolites other than histamine, which is devoid of chemotactic properties. It is most probably due to the release of vasodilator polypeptides from damaged cells.

Demolition

During traumatic inflammation the area is cleared of all useless, lifeless or foreign material, including dead and dying leucocytes and tissue cells, bacteria and their capsules, nuclear chromatin, blood pigment, fibrin, the sarcoplasm of dead muscle, disorganized collagen fibre, the matrix of dead bone and cartilage, disintegrating neutral fat, fatty acid crystals, lipoid, disintegrating myelin, as well as sutures, talc and fabric from dressings and clothing. The transformation of this particulate and often *insoluble material into soluble breakdown products capable of* being removed by lymphatics must be complete before perfect healing can be achieved, and when the *speed and efficiency of the demolition process* are considered, it is difficult to believe that it could be carried out solely by the slow, piece-meal process of *intracellular* liquefaction.

Biochemical environment of healing

It is, in fact, usually agreed that in addition to phagocytic cells, healing wounds constantly contain a variety of extracellular enzymes such as proteases, peptidases,

cathepsins, lipases, ribonucleases, fibrinolysins, and the like, which by their progressive accumulation very materially assist in the demolition process in its various stages. Several of the proteolytic enzymes are found to be bound to cytoplasmic particles, suggesting an origin from cellular disintegration. These liquefying enzymes have no effect on living cells or on the intercellular material they maintain, because living tissues and normal plasma contain appropriate anti-enzymes and the cells are protected by the selective action of an intact plasma membrane.

The new population of phagocytic cells exists in a precarious environment, has no organized blood supply, and many observations suggest that where demolition is active the cellular environment and intracellular respiration become anaerobic. Glucose is broken down in the absence of free oxygen, the tissue reaction veers to the acid side, the *p*H and the oxidation-reduction potential fall, and it is claimed that the concentration of lactic acid in the wound and in the blood rises Wound acidity in this phase has been claimed to produce pain, and it is said that when the *p*H of a wound falls below 5 9 this becomes almost intolerable It is also claimed that pain endings are stimulated by an excess of potassium ions

As granulation tissue is formed the wound reaction tends to swing to the alkaline side and another series of enzymes concerned with tissue growth and operating at a higher *p*H then come into play. It may be, therefore, that as provisional healing merges into definitive repair there is an anaerobic⟶aerobic oscillation which controls the enzymic activity in the wound in the various phases of repair.

THE GENERAL METABOLIC RESPONSE

During the last 25 years it has become increasingly obvious that the process of reactive inflammation in wounds is no more than the local expression of a widespread metabolic response to injury in which many tissues and organs remote from the injured area participate Every injury of any magnitude is rapidly followed by a "shock" phase characterized by general immobility, a fall in the metabolic rate and oxygen consumption, and the danger of severe or fatal circulatory failure

The period of recovery from shock corresponds approximately with the initiation and establishment of traumatic inflammation, and it is during this time that the whole organism becomes involved in this spectacular reaction whose major manifestations are fever, oliguria, hyperglycaemia, a basic alteration in protein metabolism and a series of characteristic changes in the cells and plasma of the blood. The intensity of the reaction varies within the widest limits, being slight in degree and calling for no treatment in moderate injuries and after surgical operations of moderate severity It may go on for many days and produce serious clinical complications after very severe injuries or extensive operations, more especially if they are accompanied by excessive haemorrhage It is evoked not only by any kind of physical trauma but also by burning, freezing, irradiation, and the tissue injury produced by many poisons, including bacterial toxins Arterial ischaemia of a substantial amount of living tissue produces it, as does internal or external haemorrhage. A similar sequence often occurs in the absence of any local injury It may follow a series of long-continued, exhausting and violent involuntary muscular contractions—as in tetanus, epilepsy and prolonged child-birth. Some of its manifestations occur in the reactive period after very severe pain or intense fear.

These manifold and unrelated injuries have a single common consequence They expose the organism to an environment hostile enough to threaten the homoeostasis of its vital organs, and the purpose of the reaction is to restore and maintain the constancy of the *milieu interne*. It is obviously impossible in this article to discuss this complex problem in detail but it will be appropriate to describe briefly those aspects which are applicable to the healing process. In this respect the alteration in protein metabolism and the changes in the blood are important.

Protein metabolism during reaction and repair

For a period of approximately five to eight days after moderate injuries, p anabolism is inhibited whilst its catabolism proceeds at a normal or accel velocity. Abnormally large quantities of nitrogen together with equivalent qua of potassium, sulphur and phosphorus are excreted in the urine, the nitrogen b: becomes negative, and the body-weight falls. The nitrogen loss is certainly greate can be accounted for by tissue destruction at the point of injury.

The duration of this period of excessive protein catabolism is proportional t severity of the injury After total gastrectomy for gastric cancer it is likely to la about 14 days. Severe trauma involving excessive blood loss and exposure to would extend it even further and a fall in total plasma protein may then occur; a deficiency would have a profound effect on the rate and efficiency of the he process.

It is apparently impossible to check this excessive breakdown of tissue prote the addition of protein or protein hydrolysates to the diet but except in s injuries no treatment is indicated, for there is a "turn in the metabolic tide traumatic inflammation subsides and definitive healing becomes established. nitrogen balance now becomes positive and substantial additions to the di protein are now well absorbed, rapidly and economically utilized in the re-buil of new tissue.

The hyperglycaemia during this general reaction is almost certainly du excessive gluconeogenesis brought about by the liberation of an excess of glycog residues as the result of the excessive catabolism of body protein. The oliguria ir great majority of cases is due to increased water re-absorption by the renal tub under the stimulus of the anti-diuretic hormone of the pituitary (Lewis, 1953)

Changes in the blood

The changes in the blood and plasma which form an integral part of the gen defence reaction have the same general pattern irrespective of the nature of the in and the presence or absence of infection. There is a temporary rise in the abso numbers of neutrophil leucocytes and of blood platelets, together with a typical in eosinophil leucocytes and lymphocytes. Both the coagulation and bleeding ti are shortened and there is an increase in the resistance of the capillaries to rupt by pressure. Less constantly there is an increase in the fibrinogen content of the bl and a rise in the blood viscosity producing an elevation of the erythrocyte sedimen tion rate.

Role of endocrine organs

When any injury threatens the stability of the internal environment there is rapid release of adrenaline from stimulation of the sympathetic nervous syst including the adrenal medulla. Adrenaline is able to stimulate the group of nuc lying in the hypothalamus and these are known to be capable of activating the ce of the anterior pituitary Experimental evidence suggests that when stimulated this way the anterior pituitary releases an excess of adrenocorticotrophic hormone a a discharge from the adrenal cortex of its steroid hormones.

There is no doubt that some of these adrenocortical hormones promote t catabolism of tissue protein, stimulate gluconeogenesis, increase the glycogen stor of the liver and cause hyperglycaemia Others conserve sodium ions by stimulati their resorption by the epithelium of the renal tubules These hormones also regula the level of the eosinophil leucocytes of the blood and produce lymphocytopenia.

For these and other reasons it may be assumed that the anterior pituitary ar adrenal cortex play an important part in the mechanism which adapts the body t meet many serious threats. Selye and his school go further. They believe that the organs are the essential prime movers in controlling and maintaining this reactio

There are, however, several adaptations to stress which are difficult to reconcile with this broad generalization and its final acceptance must be postponed until more evidence is available

THE DEFINITIVE PHASE OF HEALING

The granulation tissue phase

Capillary vascularization

Vigorous formation of new capillary blood vessels in the living tissue enclosing the wound becomes established as the process of demolition begins to subside. This is the first sign of true definitive healing and the sealing clot, now rapidly liquefying, is aggressively penetrated and speedily vascularized. Endothelial proliferation plays an essential part in this process but active endothelial migration is equally significant.

At the same time the mesenchymal cells of the reacting tissue enlarge considerably, multiply rapidly and migrate into the clot at the same pace as the young capillaries. Many of these cells are fibroblasts or, in bone repair, osteoblasts. Others are highly fertile undifferentiated mesenchymatous cells As in capillary penetration, proliferation and migration of cells play an equal part in replacing the clot by living tissue

The matrix of early granulation tissue is amorphous and, as its capillaries are immature, it contains an excess of fluid containing partially gelled plasma protein At a relatively early stage it is found to contain increasing amounts of amorphous polymerized muco-polysaccharides identical in composition with those normally present in the jelly-like ground substance of normal soft connective tissue.

As vascularization proceeds a similar new formation of lymphatic capillaries takes place, lymphatic drainage becomes increasingly efficient, the granulation tissue mass loses much of its excess water and becomes a firm seal of living tissue Its cells continue to multiply and migrate until an adequate and evenly distributed population of immature undifferentiated "blast" cells lying in a mucopolysaccharide matrix and provided with a copious blood and lymph supply is eventually produced

Devascularization: mesenchymal differentiation

At this point the general picture gradually changes Throughout the granulation tissue mass there is a steady progressive closure of the majority of its numerous blood and lymph capillaries whose walls come together in close apposition leaving lines of endothelial cells which migrate into the extravascular tissue and possibly become fibroblastic

As devascularization proceeds the enlarged and prominent "blast" cells become smaller, cease to proliferate, and rapidly differentiate along lines which appear to be primarily determined by their environment Those lying in the granulation tissue between the ends of a broken bone become osteoblasts, control the deposition of firm amorphous bone matrix containing collagen fibrils, and secrete an extracellular alkaline phosphatase In granulation tissue lying in soft tissues the maturing blast cells initiate and control the formation of collagen fibrils.

There are, therefore, two phases in the formation of a granulation tissue mass. The first is a process of vascularization and cellular multiplication. The second is one of devascularization and cellular maturation.

Normal endochondral ossification is characterized by aggressive capillary penetration of calcified cartilage and its replacement by young vigorous trabecular bone. It is fully substantiated that this process is controlled by pituitary growth hormone and can be totally inhibited by cortisone and ACTH. It may be, therefore, that the vascularization phase of granulation tissue formation is at least partly controlled by somatotropin and that cortisone is responsible for its devascularization. This hypothesis affords a facile explanation of the cessation of growth of granulation tissue when an adequate amount has been produced. It is supported by the effects produced by the parenteral injection of cortisone on the healing of experimental wounds,

the vascular response during the period of traumatic inflammation being impeded and capillary penetration in the granulation tissue phase seriously inhibited (Sissons and Hadfield, 1952, 1955).

Phase of epithelial regeneration

In wounds involving free surfaces, epithelial regeneration commences when the granulation tissue mass approaches the surface, provided that its own surface is free from gross contamination and adherent necrotic material

The mechanism whereby granulating surfaces are covered by a continuous sheet of epithelium—squamous, transitional, columnar or glandular—is again one of cellular proliferation followed and then accompanied by rapid migration. Until the surface is covered mitosis is strictly limited to the fertile basal cells lying at the edges of the severed epithelium and this stratum, previously one to two cells deep, becomes considerably thickened. After each basal cell has divided, one daughter cell remains in position and, after a short interphase, divides again, whilst the other glides across the surface. It is highly typical of all regenerating epithelia that their constituent cells fuse together to produce mobile cellular sheets which migrate as a whole across an appropriate surface, fusing with others on either side During this migratory phase the constituent cells of the sheets do not divide but once the surface is covered, mitosis becomes active, the sheet becomes several cells thick and the static daughter cells differentiate to produce a protective or glandular epithelium.

Epithelial regeneration may be phenomenally rapid. A large part of the whole thickness of the endometrium is regenerated monthly, the whole process occupying about seven to nine days, and the epithelial cells composing the lobules of the liver possess exceptional powers of rapid regeneration in disease.

Epidermization of skin wounds is considerably accelerated by pressure such as that produced by a reasonably tight bandage. On the other hand, the formation and differentiation of granulation tissue produced by the dermis is impeded by pressure, and the formation of a sheet of epidermis over a subcutaneous mass of granulation tissue rapidly inhibits its growth and vascularity. This suppression of granulation tissue by regenerating epithelium has not been observed in other situations. The regeneration of cutaneous glands, hair follicles and pigment is rudimentary or absent after deep injury to the epidermis Dermal papillae are often lacking, elastic fibrils regenerate slowly and imperfectly The dermal capillaries respond abnormally readily to cold and are no longer capable of producing the wheal and flare of the triple response.

FIBROGENESIS

Regeneration of connective tissues

Collagen consists of very fine fibrils, largely composed of a fibrous protein, aggregated together as fibre bundles, 5–100 microns in diameter, in which the fine fibrils are held together in an amorphous muco-polysaccharide matrix consisting of a protein combined with a sugar amine (hexosamine or galactosamine) and glycuronic acid in equimolecular proportions. This complex is highly polymerized to produce very large macro-molecules and the fibre bundles are immersed in a matrix of the same substance.

If collagenous connective tissue having a soft matrix is treated with alkali which [illegible] the polysaccharides, the fibre bundles are broken open, releasing myriads [illegible]

striated, and at remarkably regular [illegible]



Fig 141 —Electron micrograph of leg tendon of fowl Shadowed gold-palladium alloy. Magnification · × 31,000, reproduced without reduction (*Reproduced by courtesy of Randall J T, King's College, London*)

that dark cross-bands (of equal length) are seen in which it is difficult or impossible to make out any striation (Figs 141 and 142) The cross-bands are spaced along the fibre axis at regular intervals of 640 Angstrom units or $\frac{1}{16}$ micron X-ray diffraction photographs show the same characteristics and being susceptible to mathematical analysis clearly reveal that the cross-banding and cross-striation are determined by the

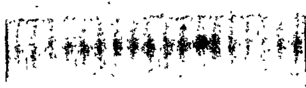


Fig 142.—Electron micrograph of rat tail tendon stained with phosphotungstic acid. Magnification × 60,000, reproduced without reduction (*Reproduced by courtesy of Randall J T, King's College, London*)

spatial arrangement of the macro-molecules of the highly polymerized fibrous protein of the collagen fibril, the bands probably being due to close aggregation of polypeptide chains. This structure is deeply imprinted on the proto-fibril and it is safe to assume that the high tensile strength of collagen is conditioned by the attainment of this

remarkable molecular design. We may therefore assume that during the process of healing in the soft connective tissues as well as in bone, the maximum tensile strength of regenerated collagen can be attained only by full regeneration of the fibrils at this ultra-microscopic macro-molecular level.

The finer fibrils of elastic tissue reveal neither cross-banding nor cross-striation, and their powers of regeneration are strictly limited. In addition to fibrils the same elastic fibre protein forms the elastic laminae of arterial walls. Elastic fibrils are present in distensible structures which, in order to carry out their function, must fully recoil after stretching. This applies especially to the skin, the bronchioles and pulmonary alveoli, and with special force to the arterial walls. For this reason, therefore, we can never expect a full return of the property of elastic recoil when the specific elastic fibres in these structures are extensively destroyed.

Collagen fibrils are very probably derived from reticulum fibrils. These form fibril networks which support the parenchyma of solid organs. Such networks have little tensile strength and in situations where this is essential the fibrils develop the typical macro-molecular structure of collagen and become orientated along lines of stress. It is highly significant that this transition is totally inhibited during periods of complete deprivation of ascorbic acid and seriously impeded if there is a relative insufficiency.

The function of cells which lie in the matrix of connective tissues—fibrocytes, osteocytes and chondrocytes—has never been clearly defined. Biologists usually insist that they play an essential part in the production and maintenance of the intercellular material in which they lie. Pathologists take it as axiomatic that if these cells are killed their intercellular material deteriorates, eventually becomes a foreign body and is absorbed.

Recent researches involving the examination of tissue cultures by the electron microscope support these views (Vanamee and Porter, 1951). The first indication of fibril production is the appearance at or just beneath the surface of the fibroblast of very fine proto-fibrils which peel off, become extra-cellular and in that situation increase in length and thickness and develop typical cross-banding. The appearances suggest that fibroblasts and oestoblasts actually produce a fibre precursor which becomes polymerized to produce reticulin and collagen at some distance from the parent cell.

FACTORS MODIFYING REPAIR

Age

A sharp distinction must be made between the rate of healing during the period of physiological growth and the deterioration of tissue structure which accompanies the [illegible] process. During normal growth all tissues are highly responsive to the un- [illegible] tissues contain a relatively [illegible] of the healing process that [illegible] also fertile and no less the cells [illegible] embryonic in appearance than their counterparts in the embryo and infant, whilst critical comparison between the healing process and normal ontogenesis reveals that they have many biochemical and cytological features in common. This resemblance is, in fact, close enough to suggest that the rate of healing at any age is under hormonal control and is related to the speed at which the tissues are growing at that time. The traditional illustration of the vigour of the repair process in young [illegible] union of birth fractures of the femur which become [illegible] and [illegible]

Up to the age of 10 years fractures [illegible] in the corresponding adult bone.

The process of aging, especially in connective tissues, has been extensively studied

in recent years Most possibly the majority of these changes are due to loss of a normal hormonal stimulus, osteoporosis of the lumbar spine in post-menopausal women being an example.

The connective tissues of the foetus and infant contain considerably more soft, jelly-like amorphous ground substance compared with fibre than in the adult. Over the years this ratio alters until in old age collagen becomes relatively plentiful and the soft connective tissues become abnormally rigid. Senile collagen shows a strong tendency to deteriorate. Its fibres swell, their permeability and staining reactions change, and hyalinization and loss of fine structure develop in many of them. Elastic fibrils and laminae show more decided changes, undergoing progressive fraying and fragmentation and the development of an increasing affinity for calcium salts. It is difficult to decide if the above changes affect the healing process to any material degree but it is very probable that the inevitable deterioration of collagenous structures will be reflected in a loss of tensile strength in the healed tissues

Wound healing in the aged is often affected by an increased liability to such conditions as bronchitis, the congestive failure and arteriolar degeneration of arterial hypertension, and a higher incidence of gastro-intestinal cancer producing anaemia and possibly a fall in the protein content of the plasma Such factors play an important part in the disruption of laparotomy wounds which has its highest incidence in individuals over the age of 50 years, and it may well be that the healing of laparotomy wounds may be primarily delayed as a result of tissue senility and atrophy but that actual disruption is precipitated by cough, abdominal distension, vomiting or, possibly, prostatic obstruction.

Nutrition

Protein deficiency

While protein deficiency may arise from a low dietary intake, persistent heavy albuminuria or recurrent ascites, it may also be due, when trauma is excessive or surgery extensive, to long persistence of a negative nitrogen balance during a prolonged metabolic reaction. If this is continued for many days beyond the seventh day there is a serious risk of hypoproteinaemia and oedema. The first indication will be a fall in the total plasma protein, chiefly affecting the albumin fraction.

Protein deficiency probably prolongs the provisional phase of repair when wound strength is at a minimum but it has a decided effect on the formation and maturation of collagen fibre and connective tissue matrix at the critical time when traumatic inflammation is subsiding, the clot seal liquefying and the strength of the wound depends largely on the sutures used to bring its edges together. It has been observed (Tweedie and Long, 1954) that there is some clinical correlation between protein deficiency and the discharge from the indolent wound of an excess of sero-sanguineous exudate. This excessive loss of exudate may exaggerate the protein deficiency, but its appearance is an indicator of excessive wound oedema and this is a potent delaying factor during repair and favours infection

How does protein deficiency produce this delay and disrupt the process of fibrogenesis? It will alter the normal osmotic relations which regulate exchange of fluid between capillary blood and the extravascular space. It will also provide fewer molecular units for the manufacture of new protein. Its effects, however, become manifest before true tissue regeneration has reached its peak, and for this reason it may be that the need for protein at this stage is, in fact, a demand for one or more essential amino acids which play a vital part in the healing process at this time.

Sulphydryl radicles

It has often been suggested that the sulphur-containing amino acids may fall into this category, d-l methionine certainly appears to accelerate healing under experimental conditions and this substance labelled with the isotope S^{35} accumulates in

substantial amounts in experimental wounds as cysteine-S^{35} (Perez-Tamayo and Ihnen, 1953) It is also claimed that there is a progressive rise in sulphydryl radicles in the early stages of experimental repair, the increase being ascribed to reduction of the cystine in the tripeptide, glutathione, which in the reduced form promotes the action of catheptic enzymes in the wound. Organic sulphydryl compounds as a group are known to stimulate mitosis in tissue culture but it is hardly justifiable, with the information at present at our disposal, to regard these compounds as specific wound "hormones". It may be justifiable, however, to look upon a rise in concentration of organic sulphydryl radicles in healing wounds as inevitable because so many potent tissue enzymes, known to be active in the process of repair, contain them

Vitamin C

It is now firmly established in man, as in all animals who are incapable of the *in vivo* synthesis of ascorbic acid, that when a total dietary deficiency of this vitamin is maintained until the reserve stores in the tissues are finally exhausted, the transformation of reticular connective tissue to collagen is completely inhibited. Ascorbic acid is found in the adrenal cortex and to a lesser extent in other organs, and it takes 100 days or more before these stored reserves are exhausted. Such a total deficiency profoundly affects normal growth and development in the child and adolescent and the production and maintenance at every age of every variety of intercellular connec- [illegible]

means whereby this inhibition of fibroplasia can be abolished other than by the administration of ascorbic acid or of food in which it is richly contained.

Absolute ascorbic acid deficiency completely arrests the definitive phase of true repair of every variety of tissue injury for it is impossible to inflict any significant injury without destroying connective tissue or stimulating healing by connective [illegible]

When the deficiency is partial, the growth, maintenance and healing of connective tissues are delayed in proportion to the degree of deficiency, but the general effect, although of lower intensity, has precisely the same general pattern as that produced by absolute deprivation

Anaemia

Healing is commonly delayed by anaemia, especially when this is of long standing and due to relatively small, frequently repeated blood losses producing depletion of the iron storage depots. Furthermore, under these conditions the blood becomes watery ("hydraemic plethora"), the plasma proteins tend to be at a low level and there is an increased tendency for wounds to become oedematous and water-logged.

INJURY OF AVASCULAR TISSUE

Wounds involving cartilage, which is normally avascular, present special problems. [illegible] by extravascular fluid which carries dissolved oxygen [illegible]

by capillary penetration of the injured area from the [illegible] normal endochondral ossification, when cartilage is so invaded its matrix becomes calcified. This obliterates the fine intercellular canaliculi and the cartilage cells undergo necrosis Healing is then considerably prolonged as the acellular matrix must be

absorbed until the area of calcified cartilage matrix can be replaced by collagenous fibrous tissue.

Traumatic inflammation and demolition will be gravely interfered with and often indefinitely prolonged if, before injury, there has been severe structural change in the walls of the small arteries and the nutrient arterioles of the injured area. This is a common result of repeated low voltage irradiation which not uncommonly produces severe degrees of obliterative endarteritis together with hyalinization of the muscle fibres of the media These changes are often accompanied by patchy areas of permanent paralytic dilatation of arterioles and capillaries, and the collagenous connective tissue in such irradiated areas is often friable and of poor quality and structure as a consequence of long-continued anoxia.

SURGICAL TECHNIQUE

Asepsis, careful handling of tissues, efficient haemostasis without mass ligation of tissue, accurate suturing without excessive tension, removal of excessive clot, and the use of separate incisions for drainage tubes in preference to drainage through the wound, are a few of the many very obvious precautions which favour speedy repair With surgical wounds, for the first five days—that is to say, during the lag period—wound strength depends entirely upon the deep sutures as clot has no tensile strength, and up to about the fourteenth day the formation of mature collagen is still far from perfect, although once started it is remarkably rapid, provided the patient is saturated with ascorbic acid Deep sutures therefore should be capable of holding for approximately 10–14 days, that is, they should neither disintegrate prematurely nor produce an inflammatory reaction. The tensile strength of catgut falls as it softens and the softening process is rapid if the inflammatory exudate is excessive. It is also quite possible, after multiple operations on the same individual, that the protein of catgut may act as an allergen capable of provoking a hypersensitive inflammation

(*See also British Surgical Practice*· Infection, Infections and Inflammation, Vol. 5, p 86, S. Key 192)

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ORGAN TRANSPLANTATION

By W. J. DEMPSTER, F.R.C.S E.
DEPARTMENT OF SURGERY, POSTGRADUATE MEDICAL SCHOOL OF LONDON

INTRODUCTION

During the last decade, a great amount of energy has been expended on the problems involved in the grafting of tissues and it seems not unreasonable to claim that some real advances have been made in our understanding of some of the laws governing the survival of grafts. The renewed interest in grafting arose from the need of finding adequate skin cover for the severely burned patients who, because of advances in the treatment of shock, were surviving injuries which a few years previously would have proved fatal. The skin homograft problem still remains unsolved, partly because the surgeon, though he has been forced to study basic physiology in the course of day-to-day surgical care, has not been required to focus his attention on problems of immunology.

Advances in immunological techniques have been extensive over the last decade but an advance in relation to grafting has defied all ingenuity. The great gap in our knowledge today concerns the inability to demonstrate directly antibodies in the serum of the host after grafting. Until some such technique is developed it will be difficult for surgeons to engage in sustained work on graft problems, but geneticists, serologists, immunochemists and biologists are now deeply committed to unravelling the problems of grafting

In this article some of the contributions which have been made to the understanding of the graft problem in recent years are reviewed. The transfer of whole organs commits the surgeon to a study of the physiological as well as the immunological aspects of the problem While this approach may complicate the experiment, it is important that such an approach should continue because it is imperative to be able to differentiate technical from immunological interruption of physiological activity.

Many physiological investigations require a denervated organ in order to exclude nervous influences, and an account will therefore be given of the function of organs transferred from one area to another in the same individual. This aspect of grafting is of more immediate interest to the clinician than some of the other recent immunological developments.

GRAFTS AND TRANSPLANTS

A graft is a popular term which implies little more than the addition of tissue removed from the same or another individual. The term graft is closely linked in the mind of the clinical surgeon with bone, artery, skin and cornea. Such tissues are applied without an immediate blood supply and are necessarily dependent on their host for any blood supply or nutriment they may need or acquire. The tissues so far mentioned serve merely to bridge a gap. They are required to maintain their own essential [illegible] in the case of cornea and elasticity [illegible] ted to heal. [illegible] en onwards the graft is expected to subserve the normal functions [illegible]

In recent years a renewed interest has developed in the grafting of whole organs In man, and in laboratory animals such as dogs, whole organs require to be grafted with an immediate and efficient blood supply otherwise irreparable damage ensues. It will be apparent that one can distinguish between two categories of grafts: (1) those

which do not require an immediate blood supply—in the case of the corneal graft, a blood supply would be detrimental to its transparency; and (2) those grafts which do require an immediate blood supply and are expected to function forthwith—to produce urine from a kidney, or hormones from an adrenal gland. The first type should be referred to as implants; the second type of grafts would be better referred to as transplants The latter then fit into a terminology already clear in all its implications to the clinical surgeon. The danger, for example, of an impaired blood supply to a uretero-colic transplant or to a segment of bowel transplant is well known. Kidney, adrenal and ovary transplants could then take their place alongside ureteric, colonic, tendon and nerve transplants.

Such a distinction is important in the larger mammals and man. In rodents, for example, such a distinction has no virtue, because some endocrine organs in whole or part can be grafted by simple implantation with some measure of success. Grafts in such animals are rapidly invaded by blood vessels, and restoration of structure and function ensues rapidly In most publications on graft problems the records refer to operations on this convenient and tolerant rodent host, and perhaps because the method was so simple certain important aspects of the problem were masked and were not appreciated until more complex methods were introduced

Definition of terms in current use in grafting

A tissue which is removed and transferred to another site on the same individual is an autograft; if transferred to another individual of the same species it is a homograft, and if transferred to an individual of another species it is a heterograft Organ transplants will be referred to as autotransplants and homotransplants Discussion will centre around the problems of these two methods and no further reference will be made to heterotransplants

Successive transplants are an integral part of the modern experimental approach to the graft problem Successive grafting is exactly analogous to the primary and secondary antigen administration of orthodox immunology. "Successive" means that, for example, one kidney is homotransplanted, and having disintegrated is forthwith removed After an interval of some days, the second kidney from the same donor to the same recipient is homotransplanted These successive transfers are usually referred to as the first and second transplant or, in other words, the primary and secondary stimulus Various modifications can be introduced Skin can be homografted and, after it has disintegrated, kidneys can be homotransplanted, or spleen can precede a kidney homotransplant. The first tissue, then, is the primary sensitizing dose. Another important modification is to transfer organs successively from two different donors the kidney from one animal followed by the kidney of another animal This latter experiment is fundamental in elucidating whether the immunity problem in tissue grafting is species-specific or individual-specific.

In dogs and man, where the blood vessels are large enough to allow of anastomosis, certain organs have been transplanted; in the dog these include—kidney, lung, spleen, heart, and in one complete anatomical unit, kidney with the adrenal and ovary of the left side In the latter case both the adrenal and ovary received their blood supply from the renal artery branches. The organ which has shed most light on the problems involved in organ transplantation is the kidney and, accordingly, most of the theoretical considerations of the homotransplant problem will be based on the evidence derived from that organ in the homotransplanted state

KIDNEY TRANSPLANTATION

At the beginning of this century, many distinguished surgeons became interested in the possibility of transplanting kidneys. Although not well documented the general impression gained was that while autotransplants were successful, homotransplants failed to survive more than a few days. At that time, however, there was no theoretical

basis on which to build a theory of homotransplant disintegration; this came many years later with the work of Medawar (1944). Accordingly, theories suggested in the past are now of historical interest only and have been reviewed elsewhere (Dempster, 1951, 1953a); other general aspects have been reviewed (Longmire and Smith, 1951; Woodruff, 1952; Bobbio and Goffrini, 1952). Medawar's theory based on a study of skin homografts provided the basis for a systematic investigation of kidney transplantation The function of the autotransplanted kidney has now been fully investigated (Dempster and Joekes, 1953 a and b) As controls for homotransplanted kidneys, autotransplants in the dog were attached to the carotido-jugular circulation which was a convenient site for anastomosis of the renal vessels; in this situation the ureter was brought out on to the neck as a ureterostomy. Such autotransplanted kidneys ("neck" kidneys) can maintain dogs in good health for long periods but there is a permanent impaired ability to concentrate urine normally; this has been attributed to hydronephrosis (Dempster and Joekes, 1953 a and b). In order to seek further data, kidneys were transplanted to the pelvis and anastomosed to the iliac vessels with reimplantation of the ureter into the bladder. These "iliac" kidneys were found to have an impaired function for about 3 weeks, after which time normal function ensued (Dempster, Joekes and Oeconomos, 1955; Dempster, Eggleton and Shuster, 1955). There is temporary inability to concentrate the urine excreted. Provided the surgical technique is adequate, transplanting kidneys to the iliac vessels is a satisfactory procedure The recovery of function is interesting in that it follows the pattern of tubular damage from ischaemia. This indicates that no definitive assessment of renal function can be made with confidence until three weeks after transplantation.

Provided there are no complications in the post-operative period, transplanted kidneys follow the pattern described above. One alarming feature in the post-operative period was the high incidence of ileo-colic intussusception—5 out of 17 operations ... complication

... the period of function, a homotransplanted kidney behaves like ... kidney in the early post-operative stage. A homotransplanted kidney is for some reason less capable of handling sodium chloride than is an autotransplanted kidney; the urinary concentration is invariably low After functioning for some time, a homotransplanted kidney suddenly becomes anuric; once this anuria is established it is irreversible. An arteriogram taken at this stage shows generalized intrarenal vascular spasm and complete or patchy cortical ischaemia; swelling of the capsule and pericapsular tissues, and also interstitial oedema cause enlargement of the kidney. The anuria does not appear to be related to the extent of the oedema (Dempster, 1954). Provided the recipient dog is allowed to retain one of its own kidneys *in situ*, the onset of anuria in the homotransplanted kidney is associated in the dog with a severe toxic syndrome (Dempster, 1953 a and b); this toxic syndrome is sometimes associated with hypertension. Within a few hours of removing the anuric kidney, the toxic effects disappear and the dog shows no further upset. If both kidneys are removed, however, the toxic syndrome is masked by repeated vomiting associated ... the developing uraemia (Dempster, 1953a).

... anuria has been described ... What causes ... we must turn ... transplanted tissues sooner or later die.

A theory of the host-homotransplant relationship

... were in many cases bizarre, but the ... of research workers were: (1) a local

immunity reaction of the host tissues against the graft; and (2) a general systemic immunity

Until recent years, the first theory held precedence over all others and this was largely on account of the immense contributions from Loeb (1945) A review of other theories besides that of Loeb is published elsewhere (Dempster, 1951) In recent years, as a result of the work of Medawar (1944), the case for a theory of generalized systemic immunity has received more and more experimental proof The experiments of Medawar were performed on rabbits and the tissue used was skin In a well-controlled

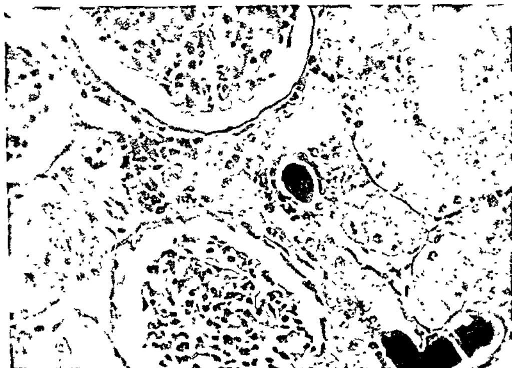


FIG 143 —Section from the kidney of a dog four days after homotransplantation The interstitial immature plasma cells and pyronine-staining enlarged endothelial cells lining two arterioles are evident (methyl green pyronine orange G. ×460)

series of experiments it was found that homografted skin survived about 10 days If, after an interval of some days, a second set of skin was grafted from the same donor to the same recipient there was a marked acceleration of disintegration of the graft. This seemed clear-cut evidence of an actively acquired immunity on the part of the host A further experiment brought to light another fact if the second grafting was carried out from a different donor, disintegration of the skin graft was not accelerated This proved that the actively acquired immunity was individual-specific and not species-specific

Following this lead, experiments were designed to test if similar laws governed the disintegration of homotransplanted kidneys. The experiments of Dempster (1953a) and Simonsen (1953) and Simonsen and his colleagues (1953) showed that the second transplanted kidney disintegrated at a faster rate than the first. One might conclude, therefore, that the anuria in homotransplanted kidneys was brought about by antibodies evoked in the host by the foreign tissue, that is to say, an actively acquired immunity was involved The exact way in which the anuria was brought about was not at first obvious since the first kidney did not show the usual signs of an antigen-antibody reaction with which one is familiar in studies on serum nephritis. It will be

profitable, however, to discuss in some detail the histological features of homotransplanted kidneys as they have a bearing on the general theory of homotransplant disintegration.

Histological features of homotransplanted kidneys

Any approach to a histological appreciation of the changes to be seen in homotransplanted kidneys should be based on the classical concept of inflammation in its widest sense. The most striking feature of the histology of a first homotransplanted kidney is an interstitial infiltration of round cells. In the past, these cells were thought



FIG. 144.—An arteriogram of anuric homotransplanted kidney (dog). The intrarenal vascular spasm is evident.

to [illegible] consists of [illegible] cell (transitional cell of Fagraeus (1948)) [illegible] be seen. In addition, the endothelial cells of the arterioles are swollen and intensely pyronine-positive (Fig 143). There is a variable amount of oedema in the interstitium of the kidney. The glomeruli appear normal but there are signs of tubular damage [illegible] kidney is allowed to remain in the dog for several hours after the onset of [illegible] order to obtain good histological material, homotransplanted kidneys [illegible] removed soon after the onset of anuria.

Recent work has established a great deal of circumstantial evidence showing that the immature plasma cell is concerned with antibody formation. Was it possible, then, that the round cell infiltration described above was a manifestation of an immune response by the homotransplanted kidney against its host? Was this cellular reaction in any way responsible for the onset of anuria in the homotransplanted kidney? X-irradiation of kidneys 24 hours prior to homotransplantation prevented the development of both the interstitial round cell infiltration and the endothelial response without in any way delaying the onset of anuria (Dempster, 1953a). Other

factors must be responsible for the anuria. Simonsen (1953) was unable to demonstrate, by the ordinary precipitin reactions, any anti-kidney antibody in the serum of the host after the disintegration of the homotransplanted kidney. There was no evidence that infection played any part in initiating anuria (Dempster, 1953a).

It seemed reasonable to suppose that the cause of the anuria was directly related to the intrarenal vascular spasm (Fig 144). Studies with cortisone showed that this was not so, some other factor produced anuria which was closely followed by cortical ischaemia Cortisone also reduced the extent of the immature plasma cells but did not prolong the survival of homotransplanted kidneys (Dempster, 1953c).

Anuria—technical and immunological

Without an adequate series of autotransplanted kidneys as controls, it would be very difficult to assess anuria in homotransplanted kidneys. Some forms of anuria are due to unknown technical causes and others appear to be the natural end-result of an immune reaction (Dempster, 1954). Both types of anuria provide many problems of their own and perhaps for any clear understanding of the mechanism one would require to extend the present knowledge of renal haemodynamics.

Plasma cells and their significance

Darcy (1952) reported that plasma cells aggregated around homo-implants of submaxillary gland in the rabbit, but there was no suggestion that they had developed from the reticulum cells of the homo-implant; the plasma cells, in fact, developed from local host cells. Studies with homotransplanted organs show clearly that no local cellular infiltration occurs in relation to the organs The plasma cells which arise in homotransplanted organs do so from the reticulum cells of the homotransplanted organs themselves, that is to say, they are not derived from the host;



FIG. 145 —Section from a second homotransplanted kidney which became anuric twelve hours after transfer. The gross oedema, haemorrhage and glomerular damage are evident (picro-Mallory ×265).

they are, in fact, a reaction against the host. Since it is agreed that homografted tissue disintegrates because of the host acquiring an active immunity against it, no special immunological significance can be attached to the plasma cell reaction around homo-implanted tissue.

Histological features of second homotransplanted kidneys

If no obvious sign of an antigen-antibody reaction in first homotransplanted kidneys has been detected, does the same position obtain in second homotransplants? Second homotransplanted kidneys become anuric within a few hours in most instances (Dempster, 1953a). The histological manifestation consists of a very severe antigen-antibody reaction This consists of widespread tubular disintegration, marked interstitial oedema and haemorrhage and a protein precipitate in the glomerular sub-capsular space (Fig 145) The glomerular tufts are the site of intense fibrinoid deposit This corresponds closely to the features seen in acute serum nephritis. This evidence lends support to the theory of an actively acquired immunity but it is by no means clear as to how this mechanism works.

We are now in a position to return to Medawar's theory and, while accepting it as explaining many experimental facts at present, certain additional facts must be added It is no longer a question of a one-sided actively acquired immunity but a dual process within the same blood stream the host reacting against the transplant and the latter reacting, as best it can, against its host The former process is, so far as we know, by far the more important factor But, supposing one were able to reduce or abolish the reaction of the host, would not the continued transformation of the reticulum cells themselves bring about the kidney's own destruction by means of sheer anatomical compression? If Simonsen's suggestion that the reticulum cells merely react against anti-kidney antibodies is correct, the homotransplant problem should not be insuperable if some means were found to suppress the host reaction. If the other suggestion is correct, the outlook is very gloomy.

A comparison of the results of dog and human homotransplanted kidneys

So far as skin homografts in humans and animals are concerned, there is little disagreement among plastic surgeons about the similarity of the end-result and the process whereby it is brought about In fact, it was the impression of a plastic surgeon (Gibson and Medawar, 1943) which provided Medawar with a basis for his theoretical approach to the skin homograft problem Not so very long ago, claims were being made about permanently successful skin homografts in man. Longmire and Smith (1951) have made the following comment·

"The confusion of the past in regard to the survival of such homografts has in recent years been replaced by the universal acceptance that homotransplants do not remain permanently viable, and attention has been directed toward a study of the mechanism of destruction and means of combating such destruction."

Be that as it may, there are now reports of long survival of human kidney homotransplants (Lawler and his colleagues, 1950; Hume, Merrill and Miller, 1952; Murray and Holden, 1954) Because of these reports an opinion, not altogether unjustified, has emerged which suggests that perhaps what applied to the kidney of the dog does not obtain in the human A leader in a medical journal voices a warning:

"For reasons that are not yet clear the human being is, in a purely quantitative sense, more tolerant of homografts of all kinds than are most domesticated animals, and kidney homografts in human beings may therefore sometimes last long enough to raise hopes which later suffer a tragic disappointment." (*Brit med J.* 1954.)

It is difficult to assess the situation because each of the above team of workers has reported only one kidney which survived a long time. The results of Hume, Merrill

and Miller (1952) show that some of the kidneys they homotransplanted into the thigh of the recipients did not secrete; this has been found a frequent complication in the dog (Dempster, 1954) Other kidneys, on removal, were grossly infected; it has been repeatedly pointed out that homotransplanted kidneys should be removed as soon as possible after the onset of anuria otherwise polymorph infiltration renders any histological observations rather inconclusive (Dempster, 1953a). The detailed study of a human kidney homotransplanted to the iliac vessels (Michon and his colleagues, 1953, and Oeconomos and his colleagues, 1953) supports most of the experimental findings in dog kidneys So far as the evidence goes at the moment, there is only a temporal and not a qualitative difference between the process of homotransplant disintegration in man and in dogs

The common antigenicity of tissues

Do the tissues of any given individual share common antigens? This was theoretically acceptable because of the evidence that antigen was related to the genetic structure of the organism Medawar (1946) showed that leucocytes and skin share some antigens in common. Dempster (1953d) showed that skin and kidney shared some antigens in common. Maumenee (1950), Müller and Maumenee (1951), and Billingham and Boswell (1953) showed that cornea and skin shared common antigens Simonsen (1953) found spleen and kidney shared antigens in common. At the moment, therefore, there appears to be a sufficient body of evidence to support the general theorem that all tissues of an individual share important antigens If skin is homografted as the primary sensitizing stimulus and then the first kidney is homotransplanted (always keeping the same donor-recipient relationship) the immediate destruction of the kidney resembles in every way that usually seen in second kidneys (Dempster, 1953d) following a first kidney as the primary stimulus This suggests that homologous anti-skin antibodies closely resemble, if not actually identical with, homologous anti-kidney antibodies.

In the light of present evidence, one can sum up the cause of homotransplant disintegration as being due to an actively acquired immunity which is specific for all tissues of a given individual The homotransplanted organ reacts against its host, but the extent to which this reaction contributes to the disintegration of the organ has not yet been absolutely defined. The outstanding gap in our knowledge concerns our inability to demonstrate, by the usual methods, any antibodies in the serum of the host against homografted or homotransplanted tissue. The precise cause of anuria in homotransplanted kidneys has not been determined and any understanding of the process involved would appear to be dependent on a detailed knowledge of where and how the antigen-antibody reaction occurs.

Antibodies to homografted tissues in general

It is well established that the disintegration of homo-implanted cancer cells is associated with circulating antibodies in the serum of the host: Hauschka (1952) has reviewed the relevant evidence. As has been pointed out above, antibodies against normal homografted tissues have not been demonstrated by the usual serological techniques Is it possible, then, that the disintegration of neoplastic and normal tissues is brought about by different mechanisms? This appeared unlikely but adequate proof was lacking. Amos and his colleagues (1954), using new methods for detecting isohaemagglutinins in mice, showed that skin homografts in mice produced antibodies which reacted with red cells and leucocytes. The mouse is a most convenient experimental animal for such a study because its red cells share important antigens with the fixed tissue cells, such an obvious sharing of important antigens does not apparently exist in other animals. The work of Amos and his colleagues (1954) merely confirms what had already been inferred from homografting experiments, that is to

say, antibodies, though not serologically demonstrable, were responsible for homograft disintegration. How the antibodies produce this disastrous effect remains a mystery. Tissue antibodies are inactive *in vitro* and it has not been possible to convey passive immunity to homografts by means of serum from sensitized animals (Michison, 1954; Billingham, Brent and Medawar, 1954). Passive immunity can, however, be transferred by lymph nodes removed from sensitized animals (Michison, 1954) Host serum transferred to the circulation of the donor has been shown to have no toxic effect on the donor tissues (Dempster, 1953a)

The fact that anti-homograft antibodies have not been demonstrated in the serum of sensitized animals has led to a certain scepticism in some quarters. On the other hand, there have been attempts to explain away this phenomenon. It has been supposed that as soon as the antibodies are formed they are mopped up by the fixed cells of the body (Medawar, 1948). Michison (1954) lends his support to arguments of Medawar (1945) as follows: "The homograft reaction is concerned with antigenic differences of a much slighter nature than in classical immunological studies, and so there is no reason to suppose that the classical immune reactions will provide anything more than a crude guide to the reactions against foreign homologous tissue. Antigens closely similar to the proteins of the animal into which they are inoculated may elicit antibody associated with the cells of the host, while antigens which differ more widely may elicit serum antibody."

This hypothesis would not explain why a homotransplanted kidney disintegrates, nor would it explain the appearance of Rh antibodies in the serum of certain women. It would be a more cautious policy to seek the cause of failure to demonstrate antibodies in ourselves. For a time, clinical pathologists denied the presence of serum antibodies in cases of the haemolytic anaemias, but modern, more sensitive techniques have shown that there are. Until more work with more sensitive techniques has been carried out it would not be wise to speculate about the nature of the anti-tissue antibodies.

Then, lastly, Burnet and Fenner (1949) drew a parallel between tuberculin hypersensitivity and the reaction against homografts: "the immune reaction is not mediated by normal antibody, but by an agent of the type that has been postulated for the production of tuberculin hypersensitivity." Lennox, Dempster and Boag (1952) failed to find evidence which would firmly support this hypothesis. At the root of the trouble may be insufficient boost to the antibody production because most workers have sought antibodies after only one stimulus; successive grafting may clarify the situation.

THE TRANSPLANTED ADRENAL

The introduction of modern therapeutic measures aiming at correcting sodium loss by the kidney under conditions of adrenal insufficiency has, to a great extent, rendered unnecessary the use of homo-implants of adrenal tissue. There are a number of instances where human subjects, suffering from adrenal insufficiency, have been treated by homo-implants of adrenal tissue, these have been reviewed elsewhere (Dempster, 1954) If one is to take seriously any claim of improvement following the homo-implantation of adrenal tissue one would require objective evidence that the implanted tissue did, in fact, survive, no such evidence has ever been furnished From what we know of the extreme sensitivity of the adrenal gland to oxygen lack it is unlikely that adequate evidence will ever be produced in man and in dog.

Levy and Blalock (1939) developed a technique of autotransplanting an adrenal gland *in toto* along with its adjacent kidney By this means the blood supply to the adrenal gland arrived via branches from the renal artery; if there are no adrenal branches from the renal artery, this technique is a failure (D... can survive with this kind of preparation pro... blood supply. Recently, Dempster (1954

processes in the adrenal cortex. Modern concepts of adrenal physiology and the mode of regeneration have been largely built up from experiments on rats. Once again, the rat is a very convenient animal. One can remove an adrenal gland, enucleate it and return the capsule and subcapsular tissues to the same animal, and within thirty days a new cortex will have regenerated; this dramatic growth of adrenal cells has led to the belief that in the normal adrenal gland the cells in the zona reticularis are dying cells which once passed from the subcapsular areas through the zona glomerulosa and zona fasciculata If one removes enucleated adrenal glands at various stages, one can quite clearly see on histological section cords of cells growing inwards —the centripetal migration of glomerulosa cells Autotransplanting dog adrenal glands commonly results in damage to many areas of the adrenal cortex. Usually the zona fasciculata and the zona reticularis are destroyed but the overlying zona glomerulosa remains intact. This is exactly what the experimentalist requires in order to test if, in the dog, centripetal migration of glomerulosa cells occurs; the evidence is against this concept, instead, nodules of glomerulosa-like cells develop in the capsule (Dempster, 1955b), the exact significance of which has not yet been determined

Another fact which emerges from the use of this type of preparation and which also contradicts a classical concept is the survival of the autotransplanted adrenal in spite of the presence of the contralateral adrenal. According to Halsted (1909) this should not occur Although Shambaugh (1936) failed to confirm Halsted's law the following principle still persists: unless a 50 per cent deficiency of any particular endocrine exists, autografts of that particular endocrine organ will not survive This clearly demonstrates the kind of contradictory and confusing evidence which results from transplanting techniques and grafting techniques. However, even with grafting techniques in the rat, it has been shown that Halsted's law has no validity in thyroid grafting (Dempster and Doniach, 1955).

Using the technique of Levy and Blalock (1939), it has been shown that the homotransplanted adrenal responds, as does the adjacent kidney, by producing in its interstitium immature plasma cells, a similar reaction can be shown to occur in the ovary as well if the latter organ be included in a block of tissue containing the left adrenal, kidney and ovary (Dempster, 1954) There is some evidence which suggests that, under the same conditions, the homotransplanted ovary suffers less damage in a given length of time than do the adjacent kidney and adrenal This lends preliminary support to some scattered evidence that in the rat the sex organs can resist the usual homograft reaction

HEART TRANSPLANTATION

Heart transplants have usually been performed to subserve some physiological investigation (Mann and his colleagues, 1933, Marcus, Wong and Luisada, 1951; Downie, 1953, Neptune and his colleagues, 1953) The latter authors have employed hypothermia techniques in the course of homotransplanting the heart and lungs *in toto* This technique is a real advance over the previous work. In their experiments, the heart functioned well for several hours For physiological studies this technique provides excellent facilities. Until the survival time is raised considerably, heart homotransplantation will provide no immunological data

LUNG TRANSPLANTATION

Various workers have developed techniques for transplanting lungs (Staudacher, Bellinazzo and Pulin, 1950, Juvenelle and his colleagues, 1951; Davis and his colleagues, 1952, Hardin, Kittle and Schafer, 1952; Neptune and his colleagues, 1953; Hardin and Kittle, 1954). No general immunological principles have emerged from

this work. Juvenelle and his colleagues (1951) studied an autotransplanted lung in a dog over a period of 5 months. With the aid of hypothermia and modern surgical techniques, autotransplantation of the lung should become a reasonably easy surgical procedure

THE FUTURE OF ORGAN TRANSPLANTATION

When all is considered, the graft problem seems to be so basic as to be part of the mystery of life itself. If one thinks in terms of long-planned research with no facile short cuts one might share the optimism of Medawar (1954)

> "I now feel certain that the clinical homograft problem is soluble, workers all over the world are discovering gaps in the immunological defences that were unheard of even five years ago, and there seems no reason to doubt that, if the homograft problem continues to be the subject of systematic and careful research, the gaps can be made a great deal wider yet."

Might one inquire just how important is the homograft problem in surgery today? Rob (1954) states·

> "The transplantation of tissues is the greatest unsolved problem of surgery. If the transplantation of organs from one person to another ever becomes a practical proposition, surgery will change overnight and expand as dramatically as it did after the discovery of antiseptics and anaesthesia."

This I consider to be an exaggeration of the situation. First, antiseptics and anaesthesia are common to all operations and so are of universal significance. Secondly, there will never be a sufficient number of organs available for transplanting to satisfy human requirements at any given time, and hence the procedure will have but limited significance Indications for homotransplanting organs, in that situation, would be limited to very few selected cases If this were not the clinical situation, how else can one explain the almost complete lack of clinical interest in the graft problem in academic circles in Great Britain? Successful skin homografting certainly would help to solve many problems in plastic surgery but the fact that plastic surgeons in Great Britain are only vaguely interested in expending energy on the graft problem suggests that, for them, the solution of the homograft problem is not very important. It is perhaps clinically more expedient to tackle problems of more immediate profit and, unless special academic units were set up to study such problems, it is unlikely that over-worked clinical units will be able to devote any time to such problems as homografting even if they desired to do so. The recent drift to nylon substitutes for arteries suggests that even when tissue is not complicated by antigen-antibody reactions its use is limited or beset with many difficulties of storage and sterilization If an inch or two of artery pre [illegible] complex are the problems of organ homotr [illegible] has fascinated the scientist for [illegible] immunology [illegible] for many [illegible] one can expect interesting developments in the years [illegible]

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3.

ABDOMINAL EMERGENCIES

See also B S P., Vol 1, p. 1, S Key 1.

Closed abdominal injuries

Value of early surgical exploration

Closed abdominal injuries are discussed by CLARKE (1954) who remarks that their diagnosis is often most exacting, is rarely possible in the early stages, and presents extreme surgical

more often performed though it may be proved unnecessary and, by added trauma, affect recovery. Nevertheless, the writer considers that on balance early exploration is justified.

... of the spine or pelvis, 9 had associated

in such cases was more stormy
spleen was made operation was
occurred within a few hours,
lesions contributing to the fatalities In those who are seen with a clear history of abdominal injury and no damage elsewhere the risks of laparotomy are minimal and a period of a few hours' observation often justified.

Clarke, R. (1954) *Lancet*, 2, 877.

Laceration of the superior mesenteric artery

Treatment

... superior mesenteric artery.

Uhestad, L. E. (1954). *Ann Surg*, 140, ...

ABDOMINAL WALL

See also B S P., Vol. 1, p 24, S. Key 3.

Retroperitoneal tumours

Classification as a guide to clinical diagnosis

ENGEL (1955) classifies retroperitoneal tumours as a guide in clinical diagnosis. The retroperitoneal space is bounded above by the diaphragm, below by the pelvic brim, anteriorly by the posterior peritoneum, and posteriorly by the abdominal wall. Retroperitoneal tumours are palpable in 75 per cent of cases They fall into 3 categories: (1) primary unattached;

carcinoma and sarcoma, mixed tumours and tumours of the renal pelvis, certain adrenal growths and pancreatic carcinomas. In the third group primary tumours include lymphosarcoma, lymphocytic leukaemia, reticulum cell sarcoma and Hodgkin's disease, while metastatic growths arise from the testicle, ovary and intraperitoneal organs Primary unattached tumours probably arise from embryological urogenital remnants but may also derive from adult retroperitoneal connective tissue, fat, nerves or blood vessels Kidney

important in producing hypertension Large hyperplastic functioning tumours of the cortex are associated with Cushing's syndrome Cortical carcinoma produces few early clinical symptoms; recurrence and metastases are common; prognosis is poor. Pancreatic tumours are cystic or solid and usually occur on the left side. Primary tumours in the retroperitoneal

Engel, W. J. (1955) *Arch. Surg*, *Chicago*, 70, 156.

Extraperitoneal pneumography in diagnosis

STEINBACH and SMITH (1955) review extraperitoneal pneumography in the diagnosis of retroperitoneal tumours, particularly in the adrenal glands. The technique consists of

cent of cases These growths arise within the medulla or sympathetic nervous system. When

mography are reported Two resulted in death, one in hemiplegia and one in dyspnoea, cyanosis and shock In 1,995 cases, however, no serious reactions occurred.

Steinbach, H. L., and Smith, D R. (1955). *Arch. Surg.*, *Chicago*, 70, 161.

Surgical treatment

gically involved. Ureteral catheters are inserted on the morning of operation. Special vascular clamps for the large vessels are employed and aortic homografts prepared. Equipment for intra-arterial blood replacement is available. General anaesthesia with endotracheal intubation is used. Incision must be generous and preferably transverse or oblique High lesions

cautery. Drainage by a soft rubber tube is usually advisable. Post-operative fluid and electrolyte balance must be maintained. X-ray therapy, if required, should not be instituted immediately Results of extirpation show that long-term survivors are few, while partial removal can only be palliative The type, location and extent of the tumour, indicate the extent of operation

Tidrick, R T., and Goldstein, M. S (1955) *Arch Surg., Chicago*, 70, 203.

ADRENAL GLANDS

See also B S.P., Vol 1, p 94, S Key 12

Cushing's syndrome

Treatment

BISHOP and his colleagues (1954) discuss the treatment of Cushing's syndrome. Treatment aims at the pituitary gland, the adrenal cortex, or the effects of the disorder. Only the first two are curative The immed
due to tumour or hyperplas
of the other was advocated
surgery. Removal of
ht side Using the postero-
ion extended to reveal the
, leaving a triangular apical
and drained. Prophylactic
reduced almost to adrenal
urs pre-operatively and on
ent glucose is administered
and after operation Cortisone is given as necessary. Subtotal adrenal-
after the first
lesions. In the
amenorrhoea
ither of whom
hypertrophied
ation followed.
but 2 showed
nsitory, but in
f the spine de-
inal pain and
to maintain in doses con-
lts show that adrenal tissue
rgery should, however, be

Bishop, P. M F, de Mowbray, R. R, Glover, J. N., and Thorne, M. G. (1954) *Lancet*, 2, 1137

Medullary phaeochromocytoma

Clinical manifestations and surgical treatment

KVALE, PRIESTLEY and ROTH (1954) describe the clinical manifestations and surgical treatment of phaeochromocytoma. A rare condition, it is yet the most common surgical lesion in the medulla of the adrenal glands. Sometimes it has no function but occasionally causes

diabetes or a raised fasting blood sugar are not rare Certain drugs may be given to assist the diagnosis but it should be remembered that the results may be obscured if sedatives or other pharmaceuticals are being used simultaneously Histamine is probably the most useful diagnostic preparation A transverse incision across the upper abdomen gives the best exposure and when the tumour is identified it must be handled gently to prevent flooding of the circulation with pressor substances Conversely, an alarming fall in the blood pressure may occur when the tumour is removed, this being worse in the sustained hypertensive cases The conditions described may be corrected with appropriate drugs during and after operation The tumours are usually unilateral, benign and single

Kvale, W F, Priestley, J T., and Roth, G M. (1954). *Arch. Surg*, *Chicago*, 68, 769.

AFTER-CARE—POST-OPERATIVE

See also B S P, Vol I, p 130, S Key 17.

Water and electrolyte balance

Control following operation

The control of water and electrolyte balance after operation is discussed by LE QUESNE (1954). A minority of patients, particularly those submitted to major surgery on the alimentary tract, require careful management if they are to be maintained in fluid and electrolyte balance

operatively, when fluids were given intravenously, the patients received no protein and only 600 calories per 24 hours The most immediately striking change observed was the

of urine on the day of operation was accompanied by a marked rise in the urine specific gravity and in urinary conc

operative levels during the

these changes last 24–36 hou

normal. Observations showed a second, more prolonged, episode of simultaneous water

water are less fully appreciated

Le Quesne, L P (1954) *Brit J. Anaesth*, 26, 450.

Circulation after operation

Study and correction of variations

CARLSTEN, NORLANDER and TROELL (1954) describe their observations on the circulation after operation Twenty-one patients were examined before and during the first day after extensive abdominal operations, the investigations included electrocardiographic examinations, exercise tolerance tests and examination of the blood in the pulmonary artery. Oxygen consumption rose after operation especially between the eighteenth and twenty-fourth hours during which time the venous and arterial oxygen contents showed a fall. The venous carbon dioxide fell markedly soon after operation, then began to rise. The cardiac output showed a marked post-operative rise of between 30 and 50 per cent, especially in the first 5–9 hours After 18–24 hours the systolic and diastolic pressures showed a slight increase. [illegible] consumption measured from 2 to 4 hours after operation increased [illegible] operative figures, but as pre-operative oxygen co[illegible] than the predicted readings, this [illegible] the heart rate showed a continu[illegible] output indicated a fall in the strok[illegible] through the coronary vessels an[illegible] insufficiency sometimes seen in aged or arteri[illegible] [illegible] effective alveolar ventila- tion is a probable cause of the reduced oxyge[illegible] ation and carbon dioxide content after operation. Fixation of the diaphragm to limit pain is probably associated with these changes. It is suggested that post-operative administration of oxygen and quick correction of any loss of blood volume would limit some of the risks described

Carlsten, A , Norlander, O , and Troell, L. (1954). *Surg. Gynec. Obstet*, 99, 227.

AMPUTATIONS

See also B S P , Vol. 1, p. 178, S Key 24

Knee disarticulation

Advantages over thigh amputation

BATCH, SPITTLER and McFA[illegible] over amputations throu[illegible] this method, it has not [illegible] unsightly, that the prost[illegible] procedure The authors [illegible]favourable opinion [illegible], and because of [illegible] belief that the stump is [illegible] effort of each new case. The indications are the same as those [illegible] of the method has been [illegible] because of lack of experience with the [illegible] the thigh, gangrene of the foot [illegible] viable skin for stump closu[illegible] the following flaps. the pos[illegible] and double posterior; the [illegible] The most advantages are pr[illegible] by a long anterior and [illegible], the lateral flap [illegible] the single anterior [illegible] the scar posteriorly. Since 1950 [illegible] tions; 6 of [illegible] and unsa[illegible] with satis[illegible] which are [illegible] infection [illegible] minimized and the [illegible] because muscle and [illegible] in the thigh, to [illegible] in 23 cases patellar pain [illegible] the method [illegible] and gives g[illegible]

Batch [illegible] McFaddin, J G. (1954). *J. Bone Jt. Surg.*, 36A, 921.

Choice of technique in senile gangrene

Follow-up of 105 cases

[illegible] the [illegible] 105 [illegible] age [illegible] and [illegible] were [illegible] fract[illegible] [illegible] arteriosclerotic ulcers [illegible] infectious gangrene, [illegible] intertrochanteric [illegible] desirable. Of the

Gritti-Stokes amputation was performed too often on poor risk patients; he prefers the simple rapid low thigh or supracondylar, or, as a compromise, the Callander operation Of the 54 patients who left hospital, 27 were dead at the time of this follow-up (June 1953) The amputations undergone included 12 low thigh, 3 Gritti-Stokes, 1 Callander, 2 transmetatarsal and 2 toe. The survivors underwent the following amputations: 8 low thigh, 3 Gritti-Stokes, 3 Callander, 1 below knee, 8 transmetatarsal, 2 toe, 2 patients had no operation Early in 1948, transmetatarsal amputations were begun in carefully selected cases, with gangrene involving more than one toe or a portion of the foot There were 12 patients, in 6 of whom a preliminary or simultaneous sympathectomy was performed through a modified Royle incision The amputations were performed as outlined by McKittrick (1949). Five cases were successful, indicating the value of sympathectomy In the 6 cases where sympathectomy was not performed, there were only two successes In doubtful cases the period of observation before and after sympathectomy was prolonged, in order to decide the best site for amputation Proper study of the patient should be made before operation and before consulting the limb-fitter McKenzie of Roehampton has said that age alone does not preclude successful limb-fitting

McGoey, P F (1954) *Canad. med Ass. J*, 71, 469

ANAESTHESIA—GENERAL

See also B S P., Vol. 1, p. 205, S Key 26

Major operations on exsanguinated patients

Anaesthetic technique

GORDON, GRANT and GRIGOR (1954) describe an anaesthetic technique permitting of

retention became evident and haematemesis and melaena occurred, despite blood trans-

and maintained
lequate and the
lerable clot, this
These infusions
s of abdominal
ned through the
the ulcer After

of the exsanguinated patient In this case, such a technique might have permitted of gastrectomy and death from fistula have been avoided.

Gordon, I., Grant, J C, and Grigor, K. C (1954). *Lancet*, 2, 899.

Analgesia in the treatment of compression fractures

Technique

SPENCER (1954), discussing the treatment of acute compression fractures, recalls the

the ligamentum flavum at the second lumbar level. A catheter is passed into the needle, needle removed and the anaesthetic solution injected. The degree and extent of analges can vary from a localized band to anaesthesia of almost the entire body. Since segmenta analgesia can be obtained, the patient can co-operate in the procedure, an advantage im-possible in general or spinal anaesthesia. A case is reported of a man admitted to hospital after a 600 lb cement block had fallen on him. He was in the prone position and had severe kyphosis of the lower dorsal spine. There was no evidence of injury to the cord. Intramuscular Demerol and Xylocaine infiltration into the muscles and fascia gave no relief. An extradural block was therefore undertaken. A Touhy needle was inserted into the first or second lumbar interspace and a catheter passed cephaled towards the eleventh dorsal vertebra. After Xylocaine injection, Pantopaque was injected and more radiographs taken, revealing compression fractures of the tenth and eleventh dorsal vertebrae. Within 10 minutes the patient experienced relief and was breathing deeply. There was partial motor power in the lower extremities, but loss of sensation. In the operating theatre, with his active participation, the fractures were easily reduced. A hyperextension jacket was applied with the epidural catheter *in situ*. This was withdrawn after 24 hours. Xylocaine was repeated twice on the day of admission and once the following day; Demerol hydrochloride the first 2 nights, codeine the third night. The patient began to walk on the third day. On the seventh day a radiograph showed Pantopaque along the eleventh and twelfth nerves and the fractures remained reduced. On the twelfth day, he was discharged ambulatory. Continuous extradural analgesia is excellent for severe compression fractures, but is contra-indicated in the presence of a fracture-dislocation or compression of the spinal cord.

Spencer, G. E., Junr. (1954) *Amer J Surg.*, 88, 653.

Application of anaesthesia to diagnostic urology

Toxic reactions

SENGER and ZORGNIOTTI (1954) have made a study of topical anaesthesia in diagnostic urology. They sent a questionnaire to 171 chief residents serving approved urological residencies throughout the United States of America, and received 54 satisfactory replies. The replies to the questionnaire yielded the information that 29 of the institutions favoured some sort of topical intra-urethral anaesthetic for cystoscopy; 15 institutions did not use an anaesthesia at all, in 7 institutions intravenous thiopentone was used alone, or in combination with gaseous anaesthetics, finally, spinal and caudal anaesthesia were used to the exclusion of other forms of anaesthesia by 4 of the hospitals questioned. Thirteen different anaesthetic agents were cited in the replies received and the methods preferred for instillation were very varied. Twenty-six toxic reactions were reported, including 7 of the authors' own patients, in 24 of the 26 reactions the bulb syringe had been used as means of application. Six of the reactions were fatal, and the reactions involved 9 different anaesthetic agents. Replies to the questionnaire elicited the information that nearly all operators employ a quantity of the topical drug which, if totally absorbed into the blood stream, would produce toxic manifestations. Most reactions manifested themselves as stimulation of the cerebrum and the authors state that the best treatment is injection of a short-acting barbiturate intravenously combined with the administration of oxygen. The period of stimulation may be brief and there may be sudden loss of consciousness, flaccidity, and ultimately respiratory and circulatory failure. For treatment the authors recommend oxygen, artificial respiration, head-down position, heat, intravenous fluids, and circulatory stimulants, as well as early release of the penile clamp and evacuation of the bladder. Circulatory collapse without central nervous system reaction was rare, and so also were allergic responses such as urticaria, angioneurotic oedema, and asthma. The authors find that the best treatment is epinephrine and antihistamines.

Senger, F. L., and Zorgniotti, A. W. (1954) *J Urol.*, 72, 748.

Pethidine

Venous reactions

ARGENT and DINNICK (1954) describe phlebitis following injections of pethidine. This substance is chemically related to atropine and was primarily used for a time as an analgesic for the first stage of labour. Rapid intravenous injection quickly reduces blood pressure and may affect breathing, but the most troublesome reactions often occur at the site of injection, and within a few minutes local reddening and wheal formation is frequent and any blood leaking nearby forms a haematoma characteristic of a typical histamine reaction. A reaction in the skin may also develop quickly over the site of injection. The phenomena described were first attributed to the chlorocresol also present in the ampoules but experiments showed

this assumption to be faulty Thin and old patients react in the way described more often than others and a poor peripheral circulation also has an adverse effect. With successive injections into the same vein the severity of the reaction increases but 100 milligrams of the preparation diluted in 1 litre of saline and given slowly have no local effect, and less dilute solutions may also be well tolerated in some patients Premedication with an antihistamine does not prevent the reaction Experiments show that histamine is liberated from the skin of cats by pethidine injections and a similar mechanism may occur in man. The acidity of the solution does not appear to be harmful and if the drug is well diluted it is found that a suitable protection is obtained by adding procaine.

Argent, D E , and Dinnick, O, P. (1954) *Brit. J Anaesth* , **26**, 260.

APPENDICITIS—ACUTE

See also B S P , Vol 1, p 293, S Key 35.

Appendicectomy

Reduction in mortality rate

Reporting on studies of appendicectomies performed at the Toronto East General Hospital before and after World War I, PLEWES and TESKEY (1955) record a tenfold reduction in the

the appendix Threadworms were recorded in 41 instances During the post-war period only 3 of 10 deaths were found to have resulted directly from appendicitis or its sequelae The trend towards earlier diagnosis and treatment was indicated by a decrease of 10 per cent in the number of cases of ruptured appendix and by an increase of 10 per cent in the number of clinically acute cases in which the diagnosis was not confirmed on pathological examination The authors conclude that immediate operation should be performed in all cases of acute appendicitis

Plewes, B , and Teskey, L , Junr (1955) *Canad med Ass J* , **72**, 175

ARTERIES

See also B S P , Vol. I, p 327, S Key 37

Arteriography

Animal experiments

HOL and SKJERVEN (1954) in evolving a method for arteriography in dogs, observed

the ligamentum flavum at the second lumbar level. A catheter is passed into the needle, the needle removed and the anaesthetic solution injected. The degree and extent of analgesia can vary from a localized band to anaesthesia of almost the entire body. Since segmental analgesia can be obtained, the patient can co-operate in the procedure, an advantage impossible in general or spinal anaesth[illegible] is reported of a man admitted to hospital after a 600 lb cement b[illegible]e was in the prone position and had severe kyphos[illegible]vidence of injury to the cord. Intramuscular [illegible]uscles and fascia gave no relief. An extradural [illegible] A Touhy needle was inserted into the first or second lumbar [illegible] catheter passed cephaled towards the eleventh dorsal vertebra. After Xylocaine injection, Pantopaque was injected and more radiographs taken, revealing compression fractures of the tenth and eleventh dorsal vertebrae. Within 10 minutes the patient experienced relief and was breathing deeply. There was partial motor power in the lower extremities, but loss of sensation In the operating theatre, with his active participation, the fractures were easily reduced A hyperextension jacket was applied with the epidural catheter *in situ* This was withdrawn after 24 hours. Xylocaine was repeated twice on the day of admission and once the following day. Demerol hydrochloride the first 2 nights, codeine the third night The patient began to walk on the third day. On the seventh day a radiograph showed Pantopaque along the eleventh and twelfth nerves and the fractures remained reduced On the twelfth day, he was discharged ambulatory. Continuous extradural analgesia is excellent for severe compression fractures, but is contra-indicated in the presence of a fracture-dislocation or compression of the spinal cord.

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APPENDICITIS—ACUTE

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ARTERIES

See also B S P, Vol 1, p 327, S Key 37

Arteriography

Animal experiments

HOL and SKJERVEN (1954) in evolving a method for arteriography in dogs, observed

aortography, the great stream of blood dilutes the medium, reducing risk to a minimum. Experiments were made here to determine whether abdominal aortography under unfavourable conditions produced damage of the spinal cord in animals Rabbits weighing from 2 to 3 kilograms were anaesthetized In one group, the contrast medium was injected with the animals supine, in a control group, the prone position was used. A saturated solution of trypan blue was then given intravenously, the animals bled and the dye washed from the vessels. The contrast medium, 70 per cent Diodrast solution, was injected into the left renal artery The kidney was exposed and its vessels tied Proximally to the ligature, a blunt

produced staining more caudally. Injection after a 2-minute interval showed widespread

analgesia can be obtained, the patient can co-operate in the procedure, an advantage impossible in general or spinal anaesthe...

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Animal experiments

Hol and Skjerven (1954) in evolving a method for arteriography in dogs, observed

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apply to other animals, but the lesions are less readily produced in dogs and man, since the medullary cone terminates between the sixth and seventh lumbar vertebrae in dogs, while in man the cord ends at the first lumbar vertebra. Toxic spinal-cord damage may be presumed to occur even in man under unfavourable conditions. Because of the arrangement of the blood supply to the human cord, damage would have to be comparable with lesions in the rabbit at the injection site

Hol, R., and Skjerven, O. (1954). *Acta radiol., Stockh.*, 42, 276.

Arterial grafting

Plastic substitutes

Restoration of vascular continuity by homologous grafts is discussed by LORD (1954) The best substance, next to an autogenous arterial graft, with which to bridge a gap between the ends of an artery, is a fresh autogenous vein graft, vein grafts, however, must not be used in the aorta, and probably should be avoided also in the innominate, left subclavian, and common iliac arteries. As grafts for the aorta must be of relatively equal size, segments of

calcification, aneurysm, or arteriosclerosis, in contrast to late calcification of some homo- [illegible] the frozen state. Orlon, another [illegible] has a lesser tendency to show [illegible] is resumed. As the application of plastics cannot yet be evaluated, however, homologous aortic grafts, stored preferably by the freeze-dry or the freeze-cathode x-ray technique will still be used for large arteries and autogenous vein grafts for smaller arteries.

Lord, J. W, Junr (1954) *N.Y St J. Med*, 54, 2578.

Vinyon "N" cloth prosthesis.—BLAKEMORE and VOORHEES (1954) advocate the use of a plastic textile, Vinyon "N" cloth, for constructing arterial prostheses In a series of experiments on [illegible]

[illegible] in the treatment of 17 arteriosclerotic aneurysms of the [illegible]

[illegible]

Blakemore, A H, and Voorhees, A B, Junr. (1954) *Ann. Surg*, [illegible]

Obliterative vascular disease

[illegible] tive vascular disease. Clinical and [illegible] requent pathological change leading

to thrombosis is the patchy atheroma seen typically in the popliteal artery and the superficial femoral at the level of the adductor opening. Obstructive vascular disease below the knee tends to present with trophic lesions or rest pain; this tends to persist in cases of thrombo-angiitis obliterans, 27 out of 42 being first seen with these symptoms; recurring superficial thrombophlebitis drew attention to the underlying cause in 5 cases. Intermittent claudication with a well-nourished limb distally indicates obstruction of the femoral or popliteal artery [illegible]

ulceration or digital gangrene of the foot was observed; in 72, the condition was the end-result of widespread arterial disease, but 15 had normal pulsation as far as the forefoot. Treatment of digital gangrene is sympathectomy or reflex vasodilatation by physical or [illegible]

in over 100 cases; radioactive sodium was found to be suitable for investigating circulatory functions; oscillometry was of very limited value; arteriography is the most valuable single investigation when surgery is contemplated. Surgical techniques include lumbar sympathectomy, arteriectomy and endarteriectomy, and blood-vessel grafts. Those few cases with primary popliteal thrombosis and normal arteries elsewhere offer the best prospects of success from grafting.

Morrissey, D M. (1954) *Ann. R. Coll Surg, Engl.*, **15**, 250.

Femoral embolectomy following acute coronary occlusion

Technique

[illegible]

3 hours after the onset of pain an operation was performed under local anaesthesia. An incision was made over and in line with the right femoral artery, in the femoral triangle, and the artery freed. The arterial wall was not thickened or calcified. Tapes were applied round the artery, which was opened between them; several small clots were removed. Pressure on the proximal tape was released, and a thrombus 50 millimetres long shot out of the vessel; sodium citrate and heparin were injected through a ureteric catheter inserted into the distal part of the artery The incision was closed with an arterial suture, the sheath of the artery was not closed The circulation improved markedly at the end of the operation; the limb, however, remained mottled and cyanosed for about 12 hours. An intermittent venous occluder was left on the limb for 24 hours, after which the circulation appeared to be normal. The post-operative course was uneventful, and the patient was discharged quite well 5 weeks after embolectomy

Althorp, E K, and Yearsley, J. K. N. (1955) *Brit med J*, **1**, 30

Arterial homografts

Animal experiments in chemical sterilization

TRAFAS and his co-workers (1954) have carried out some investigations on the chemical [illegible]

four hours later segments were cut off the specimens and used as grafts to bridge defects in the abdominal aortas of recipient dogs. In no instance was a positive culture obtained from an aortic specimen after 24 hours' treatment with diacetylethylene; there was no instance of infection of the graft after implantation. When grafts were implanted within 5 days of

treatment with diacetylethylene all the recipient animals died as a result of haemorrhage at the suture line When grafts were stored for a month after such treatment no deaths occurred from haemorrhage, but there was a very high incidence of obliterative aortic

for contamination were *Escherichia coli* and *Aerobacter aerogenes*; dessicated *B. globigii* spores were also added *Beta*-propiolactone was added immediately to a concentration of 1 per cent The mixture was incubated for 2 hours, after which bacterial counts were made and no viable organisms were recovered. The grafts were then removed and stored in modified Tyrod's solution at 4 degrees centigrade for varying periods before implantation into recipient animals. In a series of 15 recipient animals there was no instance of fatal haemorrhage and only one instance of thrombosis Four of the 15 animals died of causes not related to the nature of the grafts Ten of the survivors were killed after 3 months and the other after 2 years

Trafas, P. C, Carlson, R E, Lo Grippo, G A, and Lam, C. R (1954). *Arch Surg, Chicago*, 69, 273.

Injury to femoral artery

Treatment in 2 accident cases

STEPHENS and his colleagues (1954) report 2 cases of injury to the femoral artery The first, a butcher, aged 35 years, received a wound from a sharp knife just below Poupart's ligament, haemorrhage was profuse. On immediate admission to hospital, the pulse was not palpable and he was still bleeding, with a large haematoma in the groin Bleeding was controlled and an intravenous dextran transfusion administered His condition improved, and 4½ hours later blood transfusion was begun. The dressings were removed at operation, … The common, superficial and deep … wound was … cycle when racing … groin. A tourniquet was applied. On its removal in hospital, 1½ hours later, there was oozing from the upper third of the thigh A vertical incision of 6 inches was made over the femoral artery, which was clamped The common and deep femoral arteries were intact, the superficial was torn across and a gap of 1½ inches existed between the divided ends, which were contracted The proximal end just distal to the profunda was ligated, as was the distal end. The wound was excised and closed except for drainage Five days later, the posterior tibial pulse was felt.

Stephens, J. P, Walker-Brash, R. M T., and Noon, C. (1954). *Brit. med. J*, 2, 916.

Incisions and sutures

Anatomical considerations

… and sutures in arteries Suturing of arterial incisions is … of the anatomical … he internal elastic … the median layer is dense and thick and is characterized by the sparseness of … may … iscle … the … are longitudinal and are separated by looser connec… of arteries … nsile stress … transverse … uch cases a

shearing stress occurs Consideration of anatomical structure, and the results of histological studies of healing, suggest that intima should be sutured to intima with everting sutures, including all coats of the arterial wall

Wehn, P. S. (1954). *Acta chir. scand.*, 108, 231.

Periarteritis nodosa

Surgical aspects and the differential diagnosis in other abdominal diseases

Surgical aspects of periarteritis nodosa are discussed by Donnelly and Campbell (1954).

Donnelly, G H , and Campbell, R E (1954) *Arch Surg , Chicago*, 69, 533

Arteriosclerosis obliterans

Reconstructive surgery of the femoral artery

Experiences with reconstructive surgery of the femoral artery in arteriosclerosis obliterans are described by Warren (1954) In a period of 12 months, 29 limbs demonstrating symptoms of ischaemia were subjected to arteriography or aortography. The site of occlusion was the

with intermittent claudication, 2 with rest pain and intermittent claudication, and one with tissue necrosis of the tips of the toes. Practical considerations included (1) type of graft, 7 autogenous veins and 3 homologous arteries were used; (2) preparation of the patient;

hypotension and examination of the lower limb, hourly for the first 8 hours; re-operation was necessary twice in the 10 cases The results of the 10 operations showed an immediately

of the graft were, arteriosclerotic constriction causing poor flow, technical constriction of the upper anastomosis, and stretching of an autogenous femoral vein graft The authors consider that a series of homologous arterial grafts may give better long-term results than the present series, which consisted largely of autogenous saphenous veins

Warren, R (1954). *Arch Surg., Chicago*, 69, 582

Plethysmographic studies following vasodilation

Samuels and Tuchman (1955) carried out plethysmographic studies of the peripheral circulation after administering vasodilators to patients with arteriosclerosis obliterans. The work was carried out under standard conditions The writers used the electronic pneumoplethysmograph with the Winsor modification, a Sanborn Twin Viso, direct writing

electrocardiograph recorder, a 4-valve venous occlusion device and a 4-point thermometer. The volume of the digit was determined, the writers using the left index finger and the two second toes Sphygmomanometer cuffs were placed on the wrist. After resting a drug was given without disturbing the patient and tracings were made at [illegible]

[illegible]

rate of blood flow for its velocity into and out of the finger is unknown. In their work the writers determined pulsation volume as also the rate of blood flow by the venous occlusion method. It was noted that there were negative descending deflections in the pulse wave *after venous occlusion. Some have attributed this to regurgitation of blood from the tip* of the digit through the arterial system, by leakage under the occluding cuff through the veins, or from incomplete obstruction and leakage from the tip of the digit to adjacent bones [illegible]

[illegible]

in large arteries does so in a pulsating fashion but in smaller vessels or collaterals pulsation is less marked. The writers measured skin temperature with the Thermistor apparatus and it was found tl [illegible]
ment, 30°–31° [illegible]
temperature ca [illegible]
found gangrene often developed in a short time Only in a few cases were peripheral estimations possible, but in all subjects oscillometric measurements were made at both ankles There was an absolute correlation based on skin temperatures and on maximal blood flow in the majority of the cases

Samuels, S S., and Tuchman, M. (1955). *Angiology*, 6, 1

Traumatic spasm

Operative procedure

[illegible]

Merryweather, R (1954) *J Bone Jt. Surg*, 36B, 652.

Traumatic spasm and thrombosis

Treatment

EDWARDS and LYONS (1954) discuss traumatic spasm and thrombosis They remark that although restoration of continuity by anastomosis or grafting is now well established the [illegible] without laceration may prove more difficult. In the second [illegible]

[illegible]

had first been treated by a tourniquet which was [illegible]

[illegible] felt in the left radial, ulnar or brachial

[illegible] of a thrombus; it was then

artery Full recovery occurred. Exploration is often successful a considerable time after injury occurs.

Edwards, W. S , and Lyons, C (1954) *Ann. Surg* , 140, 318

ARTHRITIS—SURGICAL CONSIDERATIONS

See also B S P., Vol 1, p 371, S Key 38.

Osteoarthritis of the hip

Aetiology, morbid anatomy and symptomatology

gravitates to the lower part of the joint cavity, it is here that the synovial changes are most marked, and it is probable that capsular fibrosis begins here also Shortening of capsular

enlarged, and the basal layer of calcified cartilage widened Vascular channels, some filled

surface where the cartilage loss was complete. Subchondral sclerosis below the weight-bearing area must indicate severe damage to the cartilage, and flattening indicates that bone debris has entered the joint Cysts were found in every head examined, frequently com-

and the greatest congruity of the joint surfaces is obtained. The congruous cartilage in this

evidence that they had previously had minor degrees of the changes which can cause congenital dislocation of the hip, and which can be termed congenital dysplasia. By follow-up of a number of these cases, the author was able to show that the severity of the arthritis was proportional to the tardiness of treatment of the original malformation. Considering the role of ischaemia, the author found all his specimens to be well vascularized, and, except for those few cases with massive post-traumatic necrosis of the femoral head, believes that ischaemia

stitutional disturbance, perhaps associated with endocrine dysfunction. To understand the mechanisms underlying many cases of osteoarthritis of the hip, a fuller understanding of cartilage metabolism is required

Lloyd-Roberts, G. C (1955) *J. Bone Jt. Surg.*, 37B, 8.

BACTERIOLOGY

See also B.S P , Vol 2, p 24, S Key 48.

Newborn infants

Carrier rates and antibiotic resistance of staphylococci

EDMUNDS and his colleagues (1955) report on the carrier rates and antibiotic resistance

domici

locatio

51 per

anteric [illegible] 20 per cent of cases By

cases [illegible] col, chlortetracycline and

Edmunds, P N , Elias-Jones, T F , Forfar, J. O., and [illegible]

1, 990.

Cross-infection in hospital wards

Reduction by suppression of dust on floors and bed-clothes

An investigation of cross-infection with penicillin-resistant *Staphylococcus aureus* has been [illegible] and her co-workers (1954) The object of the investigation was to

on the numbers of bacteria and dust particles which could be shaken from the bed-clothes were assessed; the bacteria in the air were counted frequently with the slit-sampler and

by which staphylococci are spread The authors believe that spread by contact may be the most important mode of dissemination of penicillin-resistant staphylococci in surgical wards and that efforts to limit contact spread would be more useful than efforts directed at air-borne bacteria.

Clarke, Suzanne K R, Dalgleish, P G, Parry, E W, and Gillespie, W A (1954). *Lancet*, **2**, 211.

Study of antiseptic hand cream

method of transfer of these organisms is by way of the hands A study was made of a new antiseptic compound—1. 6-di-4′-chlorophenyl-diguanidohexane 10,040—incorporated in a cream (Hibitane) The initial experiments showed that if sterile surgical gloves were worn on "socially clean" hands for periods of up to 2 hours, the number of organisms which could be recovered from the interior varied according to the amount of sweating which occurred, a method of culturing the skin of fingers was therefore devised In further experiments, sampling of normal untreated and of treated fingers was carried out, untreated fingers of the same hand were used as controls The results obtained with varying quantities of cream were remarkably similar. After the laboratory investigation, the effect of 10,040 hand cream was studied throughout the hospital. The cream has been in use for over 18 months and has proved successful, no instances of idiosyncrasy to the antiseptic have occurred The number of clinical cases has been reduced, and there have been no patients with serious staphylococcal infections, possibly of greater significance, however, was that those staphylococcal infections which did occur no longer appeared as groups in particular wards The authors recommend that the cream should be available at each wash-basin in departments where cross-infection is likely to occur, and used by the staff as often as possible between washings.

Murray, J, and Calman, R M (1955) *Brit med J*, **1**, 81

Prevention by treatment of carriers

nasal masks, direct treatment of the organisms in the nose and throat has sometimes been attempted Over 200 patients were the subjects of the writers' inquiry, and the organism isolated from their infected lesions or from the anterior nares of carriers was examined for coagulase production, antibiotic sensitivity and bacteriophage type Staphylococci found in ward dust, blankets and other materials were also examined but rarely tallied with the strains found in wounds or in nasal carriers A terramycin cream was prepared and was rubbed into the skin lining each carrier's nostril four times daily for ten days Three

had elapsed from the time of the last application of the cream only 3 of the original 34 carriers had *Staph pyogenes* in nasal swabs Nevertheless, as time passed, the number of carriers in the hospital steadily increased Carriers did not become sensitized to the cream but repeated treatment might make them so

Gould, J C, and Allan, W S A (1954) *Lancet*, **2**, 988.

... the male urethra without clinical or other evidence of urethritis, but if a

whom no instruments had been passed cultures were sterile in 3 cases and grew various

mentation does not materially affect the bacterial flora of the urethra Organisms may be found in the bladder different from those in the urethra, and bladder urine after prostatectomy frequently grows *Proteus* strains which were not present before.

Shackman, R , and Messent, D. (1954). *Brit. med. J.*, 2, 1009.

BLADDER—NEUROGENIC DISTURBANCES

See also B S P , Vol 2, p. 123, S. Key 56

Surgical treatment

Pudendal nerve interruption

Bors and Comarr (1954) describe their experience in 29 patients with neurogenic bladder treated by pudendal nerve interruption All the patients had signs of upper motor neurone lesions, which were caused by trauma in 25 cases, by arachnoiditis in 3 cases, and in 1 case by partial aplasia of the sacrum Fifty operations were performed, of which 23 were neurotripsies and 27 were neurotomies Twenty-one patients underwent bilateral operations, and 8 patients had only one side operated on. Twenty-two patients benefited from the operation and 7 failed to do so. The unilateral procedures were effective in 7 out of 8 cases. Eleven of the patients had nerve operations alone, and of these 8 benefited; 18 patients underwent a combination of transurethral resection with nerve operations, and of these 14 regained a balanced bladder function Erection of the penis was subsequently impaired in 16 out of 28 patients, including 2 of the patients who underwent only unilateral operations The authors state that the following requirements are necessary for operation to be indicated if the patient has command of his hands no abdominal spasticity should be present, strong enough

terminalis is an absolute contra-indication to operation. There is no clinical evidence that different results are obtained from neurotripsies than from neurotomies.

Bors, E , and Comarr, A. E (1954) *J. Urol*, 72, 666

BLADDER—POUCHES

See also B S P , Vol 2, p 131, S. Key 57.

Vesical neck obstruction

Aetiology and treatment

minor relaxation of the supports of the base of the bladder, and functional imbalance between the forces of expulsion (bladder and abdominal musculature) and the forces of

freeing of the tissues round the vesical neck through a transvaginal approach. The case reports of 3 patients in whom this operation has been carried out are included.

Hock, E. F. (1954). *J. Urol.*, 72, 657

Bladder-neck obstruction in children

Treatment

Burns, Pratt and Hendon (1955) discuss the management of bladder-neck obstruction in children, and state that it is fundamentally the same problem as in adults. The types of obstruction encountered include contracture of the internal vesical orifice, congenital

study of the urinary tract is important in evaluation of the pathological changes that have occurred in the urinary tract above the obstruction. This includes chemical and bacteriological examination of the urine, renal function tests, urography, and cysto-urethroscopy. Treatment is the surgical removal of the obstruction by a modified retropubic approach or by transurethral resection supplemented by measures to correct secondary complications. In infancy and childhood the bladder neck occupies a higher position in the pelvis than it does in the adult, it is therefore easily accessible through an open approach. An incision is made through the area of the internal sphincter and extended distally as far as is necessary to expose the entire

unsound, and treatment by instalment emptying of the bladder is to be strongly condemned.

Burns, E., Pratt, A. M., and Hendon, R. G. (1955). *J. Amer. med. Ass.*, 157, 570.

BLADDER—TUMOURS

See also B.S.P., Vol. 2, p. 140, S. Key 58

Mucinous adenocarcinoma of the urachus

Treatment

treatment should consist of

peritoneum, the areolar tissue of the space of Retzius, the adjacent posterior sheath of the

duration, on one occasion he had noted painless haematuria A cystogram showed what appeared to be a large diverticulum containing a filling defect extending into the dome of the bladder. At operation the dome of the bladder was removed, together with the surrounding tissues. There was no evidence of metastasis. The pathological examination confirmed the diagnosis of a mucinous adenocarcinoma developing in the remnants of the urachus. The wound healed well and there has been no evidence of immediate post-operative recurrence

Garvey, F. K , and Nunnery, W. E (1954) *J Urol*, 72, 860.

Aetiology

Role of urinary enzymes

BOYLAND, WALLACE and WILLIAMS (1955) discuss the possible role of urinary enzymes in the aetiology of bladder cancer They point out that if there is a carcinogenic agent in the urine, it might be reasonable to suppose that it would bear some relationship to the ortho-aminonaphthols, which have been shown to be carcinogenic (Bonser) and one of which is a

indicative of carcinogenic activity The authors have investigated the enzyme activity of patients of different types and have found that patients with bladder tumours have extremely

mental animals

Boyland, E , Wallace, D M , and Williams, D. C (1955). *Brit J. Urol.*, 27, 11

BLOOD PRESSURE: HIGH AND LOW

See also B S P , Vol 2, p 189, S Key 61

Essential hypertension

Management of the malignant phase

necropsies As for the pathological changes which were observed in 3 adrenal glands

After adrenalectomy only 1 out of 5 patients survived the immediate post-operative period. Six patients were submitted to sympathectomy and total adrenalectomy. Among this group of cases 1 patient died 4 days after the first stage of the operation, but another patient survived 5½ months despite the presence of progressive coronary insufficiency. The latter patient was a woman aged 37 years who gave a history of hypertension and of thyroidectomy for toxic goitre. Congestive heart failure and anasarca developed 2 months prior to her admission to hospital. Examination revealed a systolic blood pressure of 270 millimetres of mercury and a diastolic pressure of 130, hypertensive neuroretinopathy, cardiac enlargement and gallop rhythm, hepatomegaly, pulmonary congestion and peripheral oedema. After effective treatment for congestive heart failure left sympathectomy was performed and the left adrenal gland was removed A similar operation was performed on the right side 2 weeks later. A staphylococcal empyema developed in the third case in this group and the patient died 20 days after the operation. The general condition of the fourth patient improved in spite of the development of an extra-pleural empyema and an excellent result was obtained in the fifth patient, with return of the blood pressure to normal and reversal of papilloedema. A satisfactory outcome was recorded in the last patient, a woman aged 17 years, whose condition was maintained satisfactorily with replacement therapy. It is concluded that, in the malignant phase of essential hypertension, no beneficial results are to be expected from adrenalectomy. Further investigation is required, however, in order to evaluate the use of total adrenalectomy combined with bilateral sympathectomy.

Revell, S. T. R., Junr., Borges, F. J., Yeager, G. H., Arnold, J. G., Junr., and Ahlquist, R. I., Junr. (1954) *Ann intern. Med.*, 41, 50.

BLOOD TRANSFUSION—PRACTICE

See also B.S.P., Vol. 2, p. 195, S. Key 62.

Attendant dangers

Incompatibility and other factors associated with the donor

JAMES (1954) describes some of the dangers of blood transfusion. The procedure is not free from risk and should not be trusted to the inexperienced or danger may arise from factors associated with the donor, the process of storage, the actual transfusion and some unseen condition found in the recipient. Homologous serum jaundice caused by the transmitted virus of infective hepatitis may occur when either whole blood or plasma are given, and is sometimes fatal. Any donors with a history of jaundice or who have been in contact with the disease in the previous six months are rejected. Until this danger was recognized as many as one-tenth of a group of patients receiving large pool plasma developed the condition. Allergic reactions sometimes occur and though rarely serious may yet, in the seriously ill, turn the scale against recovery. It is often wise to test the effect of 10 millilitres of plasma before giving large amounts. If a positive result is obtained only washed red cells should be given. Tropical diseases and other conditions may also be transmitted By mischance stored blood may have been contaminated, and since fresh blood has a known bactericidal power the writer doubts whether it should be refrigerated immediately after collection Unfortunately atypical coliform organisms and some others flourish at refrigeration temperature It is unwise to use blood which has been sampled for testing unless this is done immediately. The measures required to limit the dangers of incompatability, especially those of the rhesus factor are described. Blood must be given slowly and careful watch kept for overloading Air embolism, thrombophlebitis and haemolysis from warming are known risks Certain recipients, especially those who have had previous transfusions or who have borne children may be endangered by transfusion, and those with cardiovascular or blood diseases need special care.

James, J. D (1954) *Lancet*, 2, 767.

BONE GRAFTING

See also B.S.P., Vol 2, p. 225, S. Key 65.

Malformation of the Jaws

Co-ordinated methods of treatment

CONVERSE and SHAPIRO (1954) discuss bone grafting in malformations of the jaws. These malformations may be prenatal, or they may result, in postnatal life, from trauma or disease.

mandibular malformations, bone grafting may be required to restore adequate contour and function. As the bone grafts become an integral part of the skeletal framework of the face, fresh autogenous bone has been found superior to other materials for restoration of contour The bone grafts may be introduced through either external or intra-oral incisions. Cases of malocclusion of the jaws require careful study and accurate diagnosis; a proper diagnosis can be made only after clinical examination, study of photographs, and examination of the occlusion by means of casts and skiagrams. The value of cephalographic diagnosis has recently been demonstrated. A series of cases requiring contour restoration by bone grafts included (1) a girl, aged 18 years, with maxillary retrusion and malocclusion; cephalography 2 years after bone grafting showed the presence of the grafts and the maintenance of the corrected contour, (2) a man, aged 31 years, with an under-developed mandibular symphysis, in whom treatment not only restored the contour of the chin but also improved the function

Converse, J. M., and Shapiro, H H. (1954) *Amer J. Surg*, 88, 858.

BONES—ACUTE AND CHRONIC INFECTIONS

See also B S P., Vol 2, p 241, S Key 66.

Thiemann's disease

Clinical picture

SHAW (1954) describes avascular necrosis of the phalanges of the hand, known as Thie-

Shaw, E W (1954) *J. Amer. med Ass*, 156, 711.

Osteomyelitis

Treatment by cancellous bone grafts

HAZLETT (1954) describes the use of cancellous bone grafts in treating osteomyelitis

removed from the iliac crests, trimmed of all cortical fragments, mixed with penicillin and sulphathiazole powder and loosely packed into the bone cavity. The soft tissues were then closed without tension and a carefully padded dressing and plaster were applied for at least 3 weeks, and long enough to allow union of an associated fracture. Sometimes tube pedicle or other type of full-thickness skin graft was prepared before the operation or local shifts or rotation skin flaps were formed. Primary healing, sometimes delayed, occurred in 87 cases and the follow-up showed a low proportion of recurrences or conditions needing further surgery.

Hazlett, J. W. (1954). *J. Bone Jt. Surg.*, 36-B, 584.

BONES—METABOLIC DYSTROPHIES

See also B.S.P., Vol 2, p. 279, S. Key 68.

Porotic and malacic conditions of bone

Histopathology

BAKER (1954) discusses the histopathology of porotic and malacic conditions of bone. He states that in porosis the bone tissue is reduced in amount but remains firm since it contains the normal amount of calcium salt. The bone tissue in a case of osteoporosis is not therefore softened, though owing to its thinness the bone may be more flexible and is certainly more fragile than normal. In osteomalacia or rickets the bone is softer than normal, although not obviously so in the slighter grades of these conditions. Osteoporosis and osteomalacia may coexist. Hyperparathyroidism may be primary or secondary, due to some factor producing a hyperfunction of all the parathyroid tissue. In either case the bone is absorbed by a generalized increase in the numbers (and probably also the activity) of osteoclasts, and eventually a marked porosis results. Disturbed metabolism of renal origin can produce retardation of growth as a whole, rickets or osteomalacia, or osteitis fibrosa; renal rickets often combines these three changes. In the biopsies of Fanconi's disease which have been examined by the author there has been osteomalacia without osteitis fibrosa. In one case of Fanconi's disease with a secondary nephritis which has been reported there was, however, in addition to active rickets, a marked osteitis fibrosa.

Baker, S. L. (1954). *Brit. J. Radiol.*, 27, 604.

BONES—NEW GROWTHS

See also B.S.P., Vol 2, p. 298, S. Key 69.

Epidermoid carcinoma of the temporal bone

Prognosis

BROWN (1954) discusses the case reports of 7 patients with epidermoid carcinoma of the temporal bone. The longest survival time among them was 3 years. Their ages ranged from 33 to 61 years, with an average of 47 years. Four were males and 3 were females. Chronic suppuration of the ear preceded carcinoma in 2 of the cases. One patient developed metastases. The author considers that diagnosis may be easier in persons who already have discharging ears: observations may be made frequently enough that a change in the condition is noted and biopsy performed. Where the patient has never had ear trouble before, it is likely to be too late when that patient first seeks medical advice. Pain out of proportion to the physical findings, is the most common symptom. X-ray evidence of definite bony breakdown [illegible] temporal bone, if found in conjunction with carcinoma, gives a [illegible] had carcinoma of the petrosa without presenting [illegible] or nasopharynx. The author considers that [illegible] (1) not seeing the patient in time to make th[illegible] advising a patient who is in the early stages to undergo a formidable [illegible] the difficult decision of (3) the almost technically impossible task of removing all the diseased tissue. Radiotherapy alone is considered ineffective and it is recommended that the treatment of epidermoid carcinoma should entail removal of the entire temporal bone, including the facial nerve and possibly the internal carotid artery. Removal should be followed by radiation therapy.

Brown, L. A. (1954). *Ann. Otol.*, etc., *St Louis*, 63, 827.

BRAIN—INJURIES AND COMPLICATIONS

See also B.S P., Vol. 2, p. 349, S. Key 74.

Acute epidural haematoma of the posterior fossa

Treatment

SALEEBY, LEFEVER and HARMON (1954) report on a case of acute epidural haematoma of the posterior fossa The patient, a man aged 30 years, had received a severe blow on the ... haemorrhage ... semi- ... nd the ... under

exploratory burr holes should be made if the presence of a blood clot is suspected, and it should be borne in mind that the blood may extend above and below the lateral sinus.

Saleeby, R G , LeFever, H. E , and Harmon, J M (1954) *Ann Surg* , 140, 748

Extradural haemorrhages of the posterior fossa

Classification and clinical features

down and its volume probably increases as a result of osmotic factors, acute manifestations

intervention is often very urgent, and the outcome appears unusually satisfactory The results of recorded cases indicate a much lower operative mortality than that obtained in the treatment of middle fossa extradural collections

Hooper, R S (1954) *Brit. J. Surg* , 42, 19

Subacute and chronic subdural haematoma

Treatment

The treatment of subacute and chronic subdural haematomas is discussed by ROBINSON (1955) In the method recommended, burr-holes are always made under local anaesthesia; the initial burr-hole is made usually in the mid-temporal region, about 1½ inches above the zygoma, and others in the frontal and parietal areas. The most useful site for the second burr-hole is in the posterior parietal region A fine rubber catheter is introduced into the

subdural space in all directions, and ...
until ...
space
drama
it can be injected into the lumbar s...
of the burr-holes. It is unsatisfact...
for lumbar puncture; this difficult...

...metres of water, Ringer's solution is inject...
of the new method, used in 14 cases, show...
sciousness; its greatest advantage was in el...

Robinson, R. G. (1955). *Brit med J.*, 1, 21.

BRAIN—TUMOURS AND TECHNIQUE

See also B S.P., Vol 2, p. 420, S. Key 76.

Acoustic neuromas in children

Two case reports

Acoustic neuromas in children are described by CRAIG, DODGE and ROSE (1954). They ...

removed The seventh nerve appeared intact and the dura was closed. A peripheral seventh ...

described A typical acoustic neurofibroma occupying the whole cerebro-pontine angle was found of which part was removed. Great improvement followed.

Craig, W. McK., Dodge, H. W, Junr, and Rose, P. J (1954). *J. Neurosurg.*, 11, 505.

BREAST—CARCINOMA OF

See also B.S P, Vol. 2, p 456, S Key 77.

Analysis of 5-year survival rate at small and large hospitals

Twenty-three year study

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pe

per cent. among those with no nodal involvement, it was 74 per cent. These results compare favourably with those at large hospitals with superior operation facilities, and suggest that surgical technique is not of paramount significance. To determine whether the site of the

Meyer, A. C., and Smith, S S (1954) *Arch Surg*, *Chicago*, 69, 707.

Latent carcinoma

Activation by febrile illness

several metastases in the pelvis and femora but, as pain ceased, no radiotherapy was used Three years later an enlarged gland in the right axilla was irradiated as were other glands in the same place after another 3 years Ten years after the operation the patient had an acute febrile illness during an influenza epidemic which preceded general deterioration; radiographs showed a break in the sclerotic ring round one of the metastases, previously inactive and other secondaries appeared in the breast scar, responding little to radiotherapy. The patient died soon after, and at autopsy numerous secondary growths were found It appeared that the illness described broke down her previously good resistance to metastatic spread of the cancer It is suggested that the change in the appearance of the pelvic metastasis, from which the firm sclerotic ring dissolved, indicated the escape of malignant cells to other parts.

Hilton, G (1954) *Lancet*, 2, 900

Adrenal-dependent mammary cancer

Study of 100 *cases*

The characteristics of adrenal-dependent mammary cancers have been investigated by

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de

varying degree; profound regression of the cancer has persisted for more than 3 years The operation produced no improvement in 55 cases Correlations were made regarding the relationship of the following factors to the response to adrenalectomy the age of the patient

; histo-

, of the

years;

(2) those with a prolonged interval between radical mastectomy and onset of metastasis, (3) cases with a specific histological type of tumour, the most responsive tumours are composed of spheroids of microscopic size where the malignant acini have lumina whose lining

luteotrophin

Huggins, C, and Dao, T L-Y (1954) *Ann Surg*, 140, 497

Treatment

Bilateral adrenalectomy

GA

car

gens, had been ineffective, were subjected to adrenalectomy and oophorectomy

report relates to 29 cases

patients ranged from 28 to

or radiation sterilization, a

varied from 7 months to 1(

tomy, metastases were pre

... tumour of the breast was accepted at random. Pre-operative studies of adrenal cortical function were carried out; other investigations included blood chemistry studies, urine analysis, determinations of the basic phosphatase ...

... in 20 cases, the adrenal glands were removed through flank incisions over the twelfth rib with or without costectomy, the ovaries being removed through a separate incision, and in 11 cases the ovaries and adrenals were removed simultaneously through a trans-abdominal ...

... adrenal gland, blood from the left adrenal gland was shunted through the splenic vein into the portal ... without any substitution therapy. The ... was unchanged, while 17-ketosteroids ... essentially absent from the urine. The shunting procedure is purely experimental at present, and involves technical difficulties which carry a greater hazard than bilateral adrenalectomy.

Galante, M., Rukes, J. M., Forsham, P. H., Wood, D. A., and Bell, H. G. (1954). *Ann. Surg.*, 140, 502.

BURNS AND SCALDS

See also B.S.P., Vol. 2, p. 518, S. Key 82.

Severe and extensive burns

Influence of modern techniques and drugs on survival rate

ALLEN and DEGRANDPRE (1954) discuss some interesting aspects of the treatment of burns. ...

... to his survival. The patient was aged 26 years; on admission to hospital the blood pressure was 100/86, the pulse 130 and respiration 24. An intravenous injection of glucose and saline was commenced, and the wound area irrigated with normal saline and superficially cleansed. The August temperature and the extensiveness of the burns influenced the decision to use the open-air technique, except for the back, which was covered with Vaseline. Continuous ...

... litres of one-sixth molar sodium lactate. All this therapy was performed without a single blood test, except readings of pulse and blood pressure. These readings alone were sufficient to govern the quantity and time of the therapy. The amounts of fluids given, which considerably exceeded those usually recommended, caused no ill effects. The development of laryngeal oedema, 54 hours after the burn, was relieved by a ½ per cent Neo-Synephrine spray. A feature of importance in the treatment was the use of the almost forgotten technique of pinch-grafting, which was adopted because of the risk of general anaesthesia and the deficiency of donor area in relation to the recipient area. The case also demonstrated the importance of forced protein feedings, vitamins, and repeated whole blood transfusions in maintaining the patient and getting the grafts to take in the epithelialization phase of burn therapy.

Allen, J. M., and DeGrandpre, A. B. (1954). *Amer. J. Surg.*, 88, 941.

Treatment

Comparison of exposed and closed methods

... LOWBURY, CROCKETT and JACKSON (1951) discuss the bacterio- ... ry that a dry surface ... persist for 48 hours ... eschar. A comparison ... where dressing was

difficult, as on the face, buttocks or perineum For 2 days they were dusted with lactose

sixteenth day from 6 deep burns treated by exposure, and swabs taken from both surfaces The outer dry surface revealed a scanty growth of *Staphylococcus aureus*, *Str. pyogenes* and *Pseudomonas pyocyanea*, the inner purulent surface, a heavy growth of *Ps. pyocyanea* and moderate growths of *Staph aureus* and *Str pyogenes* The site at which the last-named occurred most frequently was the face, treated by exposure; the sites least often colonized, the feet and hands, treated by the closed method Here, too, the distribution of *Ps pyocyanea* was less, despite the non-prophylactic action of penicillin on this organism Burns of the trunk were then compared in 75 patients treated by the closed method and 41 by exposure Although not a controlled trial, similar organisms were found in both exposed and covered burns and colonization in the former was often heavy, especially where cracks in the eschar existed Whereas a slightly higher proportion of *Str pyogenes* and *Staph aureus* was found on exposed burns, the proportions of *Ps pyocyanea* and coliform bacilli were higher on the covered burns These, however, had the added protection of penicillin cream and the no-touch dressing technique The protection against pathogenic organisms claimed for exposure treatment was not supported in this study, but it may be indicated on clinical grounds or where adequate cover is impossible

Lowbury, E. J. L , Crockett, D J , and Jackson, D M. (1954) *Lancet*, **2**, 1151.

Methods according to degree

products, in connexion with aeroplanes and tanks The work carried out on the pathology and treatment of burns in the last 10 years has included development of the closed dressing technique; laboratory control of intravenous fluid administration, clarification of the biochemical changes associated with the stress response, re-introduction of the exposure method of primary treatment, and definition of the limitations of homografts The aims of first-aid treatment are minimum interference and maximum protection from contamination In the general treatment of any major burn, the first objective is to correct and keep pace with the depletion of the blood volume In the primary local treatment of minor burns, Cetrimide cream with a non-adherent dressing is used major burns are treated by 1 of 4 methods (1) the closed "plenary" dressing, (2) the method of local exposure, (3) envelopes, (4) primary excision and repair The secondary and later phases require attention to nutrition and anaemia. hyperglycaemia and glycosuria arise in 2 types of case, the diabetic or sub-clinical

the physiotherapist is a very important member of the burns team

Clarkson, P , and Evans, A J (1954) *Med. Pr*, **232**, 537

BURSAE

See also B S P , Vol **2**, p 534, S Key 83.

Tuberculous subdeltoid bursitis

Two case reports

Tuberculous subdeltoid bursitis is a very rare condition, and PIMM (1955) has found fewer than 10 proven cases in the literature. In presenting 2 further cases, he emphasizes the necessity for early recognition and treatment His first case was a woman aged 24 years. Four years previously she had had her right bursa excised after 2 years progressive swelling

chest, and there were bony changes in the acromion and greater tuberosity. The bursa was ... resulted. The second

splinted in

Pimm, L. H. (1955) *J. Bone Jt. Surg.*, 37B, 102.

CELLULITIS, LYMPHANGITIS, ERYSIPELAS

See also B.S.P., Vol. 3, p. 16, S. Key 86.

Lymphangitis

injected dir...
obscure. A ...
and 11 male ...

... lymphatics
... 16 patients
dye transmitted from the ... injected with diodone, and ... the lymph trunks were ... outlined with Patent Blue, injected ... lymphatics were found; the ... was injected, it
... protein absorption
... protein suggested
... with low
... lymphatic
...; this was
... treatment

Kinmonth, J. B. (1954). *Ann. R. C...*

CHEMOTHERAPY

See also B.S.P., Vol. 3, p. 40, S. Key 90.

Chemotherapy in cancer

... *of the postulates of Koch* ... chemotherapy in cancer. He states that
... of that an organism is causa-
... support of the first postulate,
... ues, the author advances the
... ns that they cause has long
... analogous to the reaction of

tissue to invading bacteria In support of the second postulate that it must be possible to

been shown to grow well. Finally, the fourth characteristic of invading micro-organisms, their ability to develop resistance to therapeutic agents, has been established for neoplastic cells It has been possible to produce a strain of cells of mouse leukaemia which is completely resistant to the suppressive action of agents functioning as anti-metabolites of folic acid The author comments on the response of mammary cancer and prostatic cancer to chemotherapeutic treatment, and also on the use of nitrogen mustards and similar compounds in acute leukaemia in man. A series of compounds related to adenine, which is a normal constituent for the repair of cellular nucleic acid, has been synthesized; these modified adenines are capable of exerting highly specific effects in blocking the ability of certain cells to reproduce The author states that not only has their specific activity been demonstrated in cultures of normal and neoplastic cells grown side by side, but selective cancer restraint can be demonstrated easily in the living animal. He looks forward to the day when chemicals will be available for the treatment of cancer as certain antibiotics are today, for one or other bacterial strain.

Rhoads, C. P. (1954) *N.Y. St J Med*, 54, 2557.

COLITIS

See also B S.P., Vol 3, p 88, S Key 97

Anorectal complications

Surgical treatment

active or because a stricture prevented adequate exposure Stricture of the rectum occurred in 19 cases, but surgical treatment for this complication was performed in only 2 instances Several patients with liquid or soft stools were unaware that they had a stricture Anorectal abscess and fistula complicated the disease in 15 cases A fistulectomy was performed in 7 cases, with gratifying results Other complications included anal ulcers and fissures, haemorrhoids and anal incontinence The author considers that during the active phase of colitis anorectal operations should be limited to emergency procedures Fulguration of polyps may be the means of preventing the development of carcinoma In the series of cases malignant changes were encountered in one instance

Jackman, R. J. (1954) *Arch. intern Med*, 94, 420

Clinical study of 201 cases

Diagnostic procedure

Jewish and one was a Negro The series comprised 106 females and 95 males; the average age, at onset of symptoms, was 29 1 years for males and 28·5 years for females. The highest incidence of the disease was in the third, fourth, and second decades of life, in that order. The most frequent symptoms were diarrhoea, loss of weight, abdominal pain, and fever.

Physical examination revealed pallor of the skin and mucous membranes and abdominal
tenderness; proc
13·4 per cent of
finding was hypo
left halves of the colon in continuity was found in two-thirds of the cases; in the remaining cases, the lesion was confined to one half of the colon, or involved both halves discontinuously; no malignant changes in the colon were encountered. Of the 201 patients, 10 received no treatment at the clinic; 150 received medical treatment; 16 had short-circuiting

Neuman, H. W., Bargen, J. A., and Judd, E. S., Junr. (1954). *Surg. Gynec. Obstet.*, 99, 563

Staphylococcal pseudomembranous enterocolitis

Complication due to treatment by aureomycin

Williams (1954) describes a case of staphylococcal pseudomembranous enterocolitis developing during treatment with aureomycin. He remarks that the tetracycline derivatives,

recorded was a girl aged 15 years who had suprapubic cystotomy for the removal of a foreign body in the bladder. She was treated by Elkesin for a symptomless fever and after a week this was supplemented by aureomycin, both given by mouth. A few days later she had a sudden onset of diarrhoea and vomiting and though the drugs were immediately
She became semicomatose and shocked and
heavy growth of *Staphylococcus pyogenes* was
iven intravenously and then erythromycin in pill form, and though remaining very ill and passing fragments of mucosa from the small
Although this form of enterocolitis
or terramycin are

Williams, E. (1954). *Lancet*, 2, 999.

Pathology of regional colitis

Observations from a series of 25 specimens

The pathology of regional (segmental) colitis is discussed by Neuman and Dockerty (1954). The term refers to an inflammatory disease of unknown origin, involving one or more

normal circumference and one specimen exhibited moderate
of the wall. Micro-
g the lesion to be
ss, involving the
showed them
n 6 centi-
eyond the
recurrence.
d. The mesenteric
f the lesion is not

so uniformly apparent, or as marked, as it is in the wall of the intestine. The authors suggest that the condition begins as a purulent cryptitis, followed by microscopical abscess formation and ulceration of the overlying mucosa.

Neuman, H W., and Dockerty, M. B. (1954) *Surg. Gynec. Obstet*, 99, 572.

COLON—CARCINOMA OF

See also B S P, Vol. 3, p 103, S Key 98

Classification

Diagnostic difficulties

[illegible]

microscopic examination of the specimen has been carried out The authors present details of 12 such cases Four cases illustrate difficulties encountered in the ileocaecal area, inflammatory lesions in this region usually involve the entire caecum including its tip, whereas [illegible] nto the [illegible] agnosis [illegible] tion of [illegible] of the rectosigmoid, cases of inflammatory and neoplastic disease in the rectum, and cases of polyposis and pseudopolyposis of the colon The authors conclude by emphasizing the close co-operation that must exist between surgeon, radiologist, and pathologist if the patient is to be offered the best chance of a happy outcome

Coller, F A, and Regan, W J (1954). *Arch Surg, Chicago*, 69, 516.

CONTRACTURES

See also B S P, Vol 3, p 155, S Key 103

Torticollis

Breech delivery as causative factor

ROEMER (1954) discusses the concept that breech delivery causes torticollis The obstetrical data of 44 cases of torticollis operated on in 25 years revealed that 27 had been delivered by breech, footling or podalic version In the remainder, there were no normal spontaneous or forceps deliveries and in 7 cases there had been rotation to the anterior occipital position, suggesting that Scanzioni and similar procedures are not inocuous The writer believes that the causative injury occurs when the already-delivered legs and trunk are raised to rotate the face out of the pelvis into the introitus, or to apply forceps to the aftercoming head It is also possible that the sternocleidomastoideus is injured before the head reaches the pelvis. Moreover, the foetal head may lie in various degrees of hyperextension, in which case uterine contractions would rupture the muscle In spite of care in avoiding muscle injury during delivery of the head, the writer has had 2 breech cases in which haematomas developed in the sternomastoid areas Whether every case of muscle tumour will develop torticollis is [illegible]

presentation Controverting this theory is the fact that asymmetry of the face, head and cervical vertebrae are not present at delivery, nor is the mechanism of torticollis *in utero* causing breech delivery easily explained Asynclitism would be a more likely explanation In this study the only case with torticollis at birth was a vertex presentation Conditions, like spastic or congenital torticollis, then, are almost certainly birth injuries, and are probably preventable

Roemer, F J (1954) *Amer J Obstet Gynec*, 68, 1146.

DEFORMITIES

See also B S.P., Vol 3, p. 180, S. Key 106.

Madelung's deformity

Treatment

Shortening the ulna to relieve traumatic Madelung's deformity was described in a discussion (1955). Though uncommon, traumatic separation of the lower radial epiphysis may cause e
on the
on the
cartilaginous disc are stretched with interference to the movements of the lower radio-ulnar joint To remedy the condition shortening of the ulna has been performed and is thought superior to an excision of its lower end. Some have thought that without the support of this bone the carpus might move to the ulnar side, yet, in fact, good results are seen. An incision is made with a saw in the long axis of the bone. It is divided at each end and a sufficient amount is removed from each tongue when the distal fragment is pulled in. If growth is still incomplete the head of the bone should be brought to a point proximal to the notch on the radius The functional and aesthetic results of the intervention are good.

Discussion at the Section of Surgery of the Royal Society of Medicine (1955) *Proc. R. Soc. Med.*, 48, 100.

Congenital dislocation of the hip

Tests in early diagnosis

HINDENACH (1955) discusses early diagnosis of congenital dislocation of the hip. This condition is characterized by a limp, a short leg and a raised trochanter in an infant aged
... clinical tests will
... the knees fully
... han the
... itation
... test is
... flexed
... ver the
... on all
infants at 2 or 3 months many later orthopaedic problems would never arise. Treatment with a Frejka's abduction pillow effects cure by the time the child is able to walk, and he will then be unhampered by manipulation and plasters

Hindenach, J. C. R. (1955) *Lancet*, 1, 15.

DIVERTICULA OF THE ALIMENTARY TRACT

See also B S.P , Vol. 3, p. 256, S. Key 109

Diverticulitis of the colon

Surgical treatment

GILCHRIST and ECONOMOU (1955) review the surgical treatment of diverticulitis of the ... after the age of 45 years It occurs primarily in the sigmoid,
... peritoneal reflection. In a post-
... the lumen of the bowel and the
... um. The influence of increased
... th obstruction due to carcinoma
... due only to inflammation in the
... le prognosis The narrow neck
... the prevention of constipation
... commended in obdurate cases.
... re free perforation, abscess for-
... ation almost always follows an
... id. Resection of the sigmoid is
... colon colostomy is indicated

and exploration undertaken.

Gilchrist, R. K, and Economou, S. (1955). *Arch. Surg., Chicago*, 70, 276.

Symptoms and surgical treatment

TODD (1955) describes surgical treatment of diverticulitis of the colon The condition received little attention until the present century when improvements in radiological technique permitted its earlier detection, but it is difficult to say if the disorder is increasing since statistics based on x-ray findings are unsatisfactory even now and sometimes at autopsy the condition is missed Males and females are now thought to be equally susceptible. Some think that continued faecal retention in diverticula indicates inflammation, but the writer disagrees and observes that barium may be retained in them for months without symptoms He thus prefers to withhold the diagnosis until symptoms develop The main symptom is pain, usually in the lower abdomen, which, if associated with dyspepsia, should suggest colonic rather than gastric disease It may occur on either side but usually on the left where tenderness is also more common It is dragging with occasional sudden stabbing Appetite may suffer and indigestion, nausea and vomiting occur, the pain is in the lower abdomen

aids adhesion of the barium and gives a better picture Inflation techniques are less safe and

long delayed. The colostomy should be closed as soon as the anastomosis is sound.

Todd, I. P (1955). *Ann R. Coll Surg. Engl*, 16, 118.

EAR—MALDEVELOPMENTS OF

See also B S P, Vol 3, p 303, S. Key 115

The auditory meatus in mongolism

Diagnostic features

Observation of a small auditory meatus as a diagnostic sign in mongolism in infancy is recorded by WALLIS (1955) In a previous publication, the author had pointed out that the diagnosis is made easier by observation of Brushfield's spots; Brushfield had not been able to find these spots in the brown iris Study of a further 10 cases has confirmed the author's surmise that at birth all mongols have blue eyes and show Brushfield's spots, although some normal children also show the spots, however, if they are not present in a newborn infant, it is not a mongol The series has demonstrated another sign, the smallness of the external auditory meatus In all 10 cases it was impossible to insert an auriscope speculum of 3 millimet

be seen on either side

velopment of the basal

previously

Wallis, H R E. (1955) *Brit med J*, 1, 30

EAR—OTOSCLEROSIS

See also B.S P., Vol. 3, p 337, S. Key 121.

Treatment

Lempert's fenestration

nic

sin

opening through the lateral wall of the horizontal semi-circular canal, covering it with the Lempert flap. This allows waves of force entering the external auditory meatus to reach the endolymph. Successful results depend upon the proper selection of patients and sound surgical technique. The writer uses the Lempert end-aural incision anterior to the auricular cartilage, upward and forward through the non-cartilaginous region above the tragus.

canal identified The bone lateral to the epitympanum is removed, exposing the malleo-incudal jc

canal, the

carried o

to allow

cellous bone. After the flap is fashioned and fitted, the fenestra is made under a constant flow of Lamp's fluid, isotonic with the endolymph; this reduces the risk of vertigo When the window is completed, the tympanomeatal flap is turned down and invaginated by the Lempert method, which prevents fenestral closure It is packed against the window with

Williams, H. L (1954). *Proc. Mayo Clin.*, 29, 533

Selection of patients for fenestration.—LAKE (1954) discusses the selection of patients for fenestration. After otosclerosis has been diagnosed and tests made, the patient's deafness, general health and emotional stability are assessed from an operative standpoint. Before considering fenestration, any external otitis should be treated Scarring of the tympanic membranes or healed perforations suggesting coexisting adhesive deafness reduce operational

line Speech reception threshold approximates the average

show proportionate results and may also have some secondary nerve degeneration The ideal patient for fenestration has a 75–80 per cent chance of success; the fair candidate a 50–60 per cent chance, the poor, a 30–35 per cent chance

Lake, C. F. (1954) *Proc Mayo Clin*, 29, 527

Results of fenestration.—CAMPBELL (1954) discusses long-term results with the fenestration operation He presents the results of 200 operations with a follow-up period of at least 5 years. In a group of 130 successful case

was only 0 5 decibels worse at the end of

49 unsuccessful cases, an average loss of

and the end of the fifth post-operative year. A third group of 21 patients had successful

and had the fenestra revised

The average loss

of the 15 cases in

of these 3 were a

commonest cause

tion as a cause of

may
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n,
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th

psychogenic deafness Infections of the ear cavity may also be a major cause of failure, and a final reason for failure of the hearing to improve satisfactorily after fenestration operation, the author believes, is the presence of a perforation in the tympanic membrane If the perforation can be finally healed, hearing can be expected to improve. It is stated in conclusion that the hearing improvement that is present a year after operation can be maintained for

Campbell, E. H (1954). *Arch. Otolaryng*, *Chicago*, 60, 265.

Post-operative care and assessment of results of fenestration.—Lillie (1954) describes the post-operative care of patients after fenestration and assesses the results of operation Penicillin is a recognized post-operative prophylactic. Packs are removed in 5–7 days, the last one overlying the flap, at 5–10 days Care of the cavity made during operation is one of deliberate neglect It is inspected and washed out every other day for a fortnight and a dusting powder of penicillin blown lightly into it if desired The patient is instructed in changing the sterile dressing in the external auditory canal, but does not replace it during

fenestra is rare; if hearing remains satisfactory for a year permanent improvement is practically certain

Lillie, J. C (1954). *Proc Mayo Clin*, 29, 532.

EMBOLISM—AIR AND FAT, CLINICAL ASPECT

See also B S P, Vol 3, p. 377, S. Key 128

Relation between tissue injury and pulmonary fat embolism

Animal experiments

Whiteley (1954) discusses the relation between tissue injury and the manifestations of pulmonary fat embolism In a post-mortem study of battle casualties and injured civilians the author frequently observed extensive pulmonary fat embolism, especially where tissues had been destroyed or damaged It was always present after fractures and often after soft-tissue injuries Minor degrees of pulmonary fat embolism were also seen in the course of routine autopsies, and the author is of the opinion that the fat in these cases is possibly derived from the liver, because carbon tetrachloride poisoning of rats produced similar degrees of fat embolism after fatty change had been induced in the liver In another group of experiments on rats it was found that muscle ischaemia produced fat emboli in 5 out of

after ischaemia had been induced in muscle Samples of each serum were incubated with tissue extracts and serum from ischaemic animals. No agglutination of chylomicrons was observed The effect of muscle ischaemia on the tolerated intravenous dose of fat was investigated by injecting arachis oil intravenously in normal rats and in animals which had first been subjected to a period of muscle ischaemia induced by tourniquet under ether anaesthesia It was found that muscle ischaemia reduced the intravenous dose of fat needed to cause symptoms or death In these animals the pulmonary emboli were larger and less numerous

than in the controls: they were found more frequently in the arterioles than was the case in the control experiments, where the emboli were usually in the pulmonary capillaries. The author concludes that there is a dual relationship between tissue injury and fat embolism; not only does fat enter the circulatory system from the site of the injury, but the injury itself modifies the pulmonary vascular bed, making it more sensitive to the presence of intravascular fat.

Whiteley, H. J. (1954). *J. Path. Bact*, 67, 521.

EPIPHYSES—DISEASES OF

See also B S P., Vol. 3, p. 442, S. Key 138.

Osteochondritis dissecans

Aetiology

There are 2 hypotheses advanced to explain the occurrence of osteochondritis dissecans—the traumatic theory, and the embolic. The occasional finding of a familial incidence has suggested an underlying hereditary or constitutional factor, and PICK (1955) reports a further example of familial incidence in support of this [illegible]
sister, aged 14 years, who presented w [illegible]
13 years, who was brought to hospital [illegible]
10 years, who had no symptoms but was found by radiography to have osteochondritis dissecans of the medial femoral condyles. In addition, the mother had a history of recurrent swelling of the knees during adolescence [illegible]
knees, the combined findings sugge [illegible]
remaining sister, aged 3 years, was r [illegible]
the disease for 3 years, with no syn [illegible]
and remain silent until late childhoo [illegible]

Pick, M. P. (1955). *J. Bone Jt. Surg*, 37B, 142.

Familial incidence

[illegible]
with a block to flexion and extension. Skiag [illegible]
medial femoral condyles in both knees, and at operation a large and almost separate cartilage fragment [illegible]
had a 5- [illegible]
sized pie [illegible]
The thir [illegible]
occasion [illegible]
[illegible]

Gardiner, T. B. (1955) *J Bone Jt Surg.*, 37B, 139

FACIO-MAXILLARY INJURIES AND DEFORMITIES

See also B S.P., Vol. 4, p. 15, S. Key 148.

Fracture of the zygoma

Treatment

Recent fractures of the zygoma which involve the floor of the orbit give rise to considerable palpebral and facial oedema, which conceal the injury. RUBIN (1955) stresses the need for [illegible]
is then looped around the upper incisors to maintain reduction. The antrum is packed with Vaseline gauze for further support. The wire is removed after 4 weeks. Three cases are described in which this technique was used, and all obtained good results Some antral

Rubin, W (1955). *Amer J. Ophthal.*, 39, 183.

FISTULA IN ANO

See also B S P, Vol 4, p 102, S. Key 154.

Classification and treatment

COUGHLIN (1954) discusses an anatomical classification and the treatment of ano-rectal fistula. He notes that every fistula due to inflammation is preceded by an abscess and its track lies in the shrunken original abscess cavity. Thus the site of the original abscess determines the type of fistula found He suggests 6 groups for classification purposes and divides each of these into one or more variants The treatment of these conditions is usually simple

cutaneous fistulae, skin, subcutaneous tissue and perhaps some fibres of the corrugator cutis ani require division, but if a fissure or ulcer is also present a posterior proctotomy is needed dividing the subcutaneous external sphincter It is important to make certain that the main track is in the submucous layer and does not pass through and external to the wall of the rectum If an anterior and posterior horseshoe fistula are found together, a stage operation dealing first with the more complicated one is preferable. Attempts to saucerize an extensive fistula sacrifice so much tissue that the resulting distortion at the anus from scarring is extreme and "relieving cuts" are needed. In treating an ischio-rectal fistula the same principles apply and the probe should be passed gently to identify the pyogenic membrane of the track

Coughlin, B. D. (1954) *Amer. J. Surg.*, 88, 768.

FOCAL EPILEPSY

See also B S.P, Vol. 4, p 114, S. Key 155.

Temporal-lobe epilepsy

Treatment

The treatment of temporal-lobe epilepsy by ...

patients at the time of operation varied from 2½ to 56 years In 14 cases the epilepsy had

convalescence was usually smooth, a few focal motor seizures occurred [illegible] of the cases during the first 10 days after oper[illegible] in most cases, a partial homonymous hemian[illegible] 12 patients became free from fits and 14 oth[illegible] epilepsy. The personality changes were benefite[illegible] [illegible] cases, markedly so in 17. Pathological changes were found in every case in the temporal lobe. In cases which exhibited discrete lesions, either small, space-occupying lesions or localized sclerosis, these were apparently the main cause of the epilepsy, and, more indirectly, of the personality disorder.

Falconer, M. A., Hill, D., Meyer, A., Mitchell, W., and Pond, D. A. (1955). *Lancet*, I, 827.

FOOT—SURGERY OF

See also B.S.P., Vol. 4, p. 132, S. Key 156.

Hallux valgus

Surgical treatment

The Keller procedure.—HOLDEN (1954) discusses the Keller procedure in the surgical treatment of hallux valgus. The condition is so painful and disabling that pursuit of an occupation may be gravely impaired. In the operation described a longitudinal incision is made on the dorsomedial aspect of the hallux, part of the base of the proximal phalanx is excised and the exostosis taken away from the dorsum and medial surface of the metatarsal head. The plantar surface of the metatarsal and the sesamoids are not touched. In a group [illegible]

footwear. If the valgus element in the hallux is not remedied, poor results may also occur. The post-operative stage is highly important, and observation for many weeks is essential; a metatarsal support may be needed while remedial exercises are being performed. If there are deformities in the other digits such as derangement of the corresponding metatarso-phalangeal [illegible] the second metatarsal [illegible]

by giving well-designed metatarsal supports.

Holden, N. T. (1954). *Guy's Hosp. Rep.*, 103, 274.

FRACTURES, DISLOCATIONS, FRACTURE-DISLOCATIONS AND ALLIED INJURIES

See also B.S.P., Vol. 4, p. 165, S. Key 157.

Fractures of the scaphoid

Diagnosis and classification

STEWART (1954) discusses fractures of the carpal navicular (scaphoid). These fractures are wrongly diagnosed more often than fractures of any other bone; they are caused in[illegible] [illegible] through the proximal palmar surface of the hand. There are [illegible] ur. fractures of (1) the tubercle; (2) the [illegible] cent of the author's cases were of this [illegible] [illegible]d 436 cases during a period of 3 years. [illegible]

in these cases demonstrated that accurate diagnosis and adequate [illegible] [illegible] bone union. In the old fractures, vacuolation or cystic [illegible] immobilization healing in the cystic [illegible] of fracture does not contra-indicate [illegible] [illegible]able, usually, after 2-3 months of [illegible] [illegible]ny union [illegible] [illegible]sis in the

proximal fragment does not contra-indicate continued non-operative treatment, in most cases the fracture will unite, and the proximal fragment will be revascularized Normal function of the wrist is seldom obtained after excision, and only rarely does bone grafting

Stewart, M J (1954). *J. Bone Jt Surg*, 36A, 998.

Intracapsular fracture of the neck of the femur

Follow-up of 100 cases

A study of 100 additional cases of intracapsular fracture of the neck of the femur, with a 94 per cent follow-up, is presented by CLEVELAND and FIELDING (1954) In the present series, the average age was 72 1 years, 7 years greater than the average in the 3 previously reported series of 235 patients; 83 per cent were females Of the 100 patients, 12 died before union of the fracture could have taken place the average age at death was 81 years, and the average time of death was 61 days after operation, there was only 1 actual post-operative death,

series took place in an average of 7 5 months after reduction and fixation Circulatory disturbance in the femoral head of united fractures with displacement occurred in 13 patients in the present series, but only 8 of these have shown signs of disability Of the entire group of 82 patients who were available for study, 67 per cent obtained completely satisfactory results, that is, union of the fracture with no circulatory impairment of the femoral head. Of the 222 cases of failure—14 patients with ununited fractures and 8 with united fractures but with severe circulatory disturbance in the femoral head—attempts to improve the

established in 7 of the cases, although the authors emphasize that they have seen no prosthetic replacement which can compare favourably with a united fracture with a living femoral head

Cleveland, M, and Fielding, J W (1954) *J Bone Jt. Surg*, 36A, 1020

Delayed union and non-union

Pathogenesis and treatment

rooming or moulding of the fracture surfaces, and (5) sealing of the medullary canal with compact bone to form functioning false joint surfaces and an apparent arrest of the process of osteogenesis in the fracture gap. A study was made of 85 ununited fractures of the shaft of the tibia and 100 control cases with similar injuries. Tabulations were made of various data, including type of fracture, length of bone damaged by the fracture; type of treatment, complications, and healing time Additional observations were made on the ununited fractures, comprising length of the bone defect or pseudarthrosis persisting at the time when bone grafting was recommended; biopsy, amputation or necropsy specimens of the tissue in the area of the pseudarthrosis, and the post-operative healing time required to produce union. The results of the study show that the mechanism of non-union of fractures of the tibia, common to all clinical circumstances, is fibrinoid degeneration of connective tissue in the

of osteogenesis, it lacks the ability of cartilage and fibro-cartilage to promote new-bone formation by induction. The effect of open operation on fresh fractures is to increase the amount of damaged bone which has to be replaced before satisfactory union results; comminuted fractures of the shaft in the adult should be considered inoperable in the first 6 months of healing. In ununited fractures, bone grafting without excision of fibro-car-

tions may be applicable in old ununited fractures with large soft-tissue defects after repeated failure of bone grafting.

Urist, M. R., Mazet, R., Junr., and McLean, F. C. (1954) *J. Bone Jt. Surg.*, 36A, 931

Condylar fractures of the knee joint

Treatment

Condylar fractures of the knee joint was the subject of the discussion at the Section of Surgery, Royal Society of Medicine (1955), when one speaker advocated treatment by continuous traction and immediate movement without any further immobilization. It was suggested that open operation should be avoided. After aspiration of any haemarthrosis ... is reduced manually as far as possible ... and active movements begin at once

2 condyles The ... at the knee for ... open operation ... T-shaped fracture, a fracture of a condyle, usually the lateral, or a detachment of small fragments from the margin of the condyle As the processes of repair continue new fibro-cartilage builds up on the debris, yet it is surprising at times to find a large hollow in a tibial condyle when the knee is quite stable

Discussion at the Section of Surgery at the Royal Society of Medicine (1955) *Proc. R. Soc. Med.*, 48, 95.

FROST-BITE

See also B S P., Vol. 4, p 232, S. Key 160

Bone changes

Study of series in Korea

The study of frost-bite is usually centred on the damage to soft tissues, and systematic studies on the bone changes, in a large, well-controlled group, have not been reported. The ... bone changes encountered in frost-bite in Korea, in 1950-1951, are described

... third-degree, and 17 ... alities at any time in ... steoporosis, which was ... he presence of osteo- ... mutilation of terminal ... lying tissues, exposure ... gment. The late bone changes close to the joints of the hands and feet are of special interest and occurred in 7 out of 62 soldiers observed for at least 8 months These changes comprised sharply-defined, punched-out defects, usually at the edge of the joint in all but 2 cases, they were not seen until 8 months after frost-bite; they frequently became larger during the first year, but no ... The soft-tissue injury and joint ... frost-bite;

Vinson, H. A., and Schatzki, R. (1954) *Radiology*, 63, 685.

GALL-BLADDER AND BILE PASSAGES

See also B S P , Vol. 4, p 238, S. Key 161

Cholelithiasis

Geographical incidence

JOSKE and his colleagues (1954) have analysed the incidence of cholelithiasis in 3,685 post-mortem examinations performed in Melbourne The total incidence was 14 9 per cent, but it varied greatly with age, being rare in young persons, the frequency increased rapidly with advancing years There was also a much greater incidence in females than in males; the disease was present in 20 3 per cent of the females, but in only 11·3 per cent of the males The predominance in females was greater in younger age-groups, and decreased with advancing age. The authors suggest that this finding supports the contention that parity has little influence on the development of cholelithiasis. The authors compare their figures with those of other observers in Australia and with those reported from Europe and America In other Australian series incidences of 10 6 per cent and 12·4 per cent have been reported, in England the reported incidences have been 8·4 per cent and 7 4 per cent, in Western Europe the figures range from 4 4 per cent to 12 per cent (Gross, 1929), while in the United States of America the reported frequency varies from 7 per cent to 20 9 per cent The authors conclude that cholelithiasis is approximately 1½ times as common in Australia as in England. They state that the reasons for these apparent variations in the incidence of cholelithiasis are not known, but it appears possible that both racial and acquired influences may be responsible

Joske, R. A , Saint, E G , Bromilow, F. J., and Hughes, E. S R (1954) *Med J. Aust* , 2, 473

Common duct stones

Diagnostic procedures

[illegible]

aged 50 years, or older The deep biliary ducts contained stones in 47 cases After extensive mobilization of the duodenum *ad modum* Kocher's palpation was performed first without, and then against a probe, and the findings were compared with those made at simultaneous cholangiography. The size of the stones was measured with a micrometer The observations resulting from the comparison were as follows: (1) palpation of the deep biliary ducts without a probe, stones were shown in 29 of 47 cases, stones were over-diagnosed more often than by palpation against a probe; larger stones, and more cases with stones, are missed [illegible]

which could not be verified; doubtful findings leading to choledochotomy occurred in 13 cases, in 1 of which stones were found at operation, stones were missed in 2 cases, stones 5 millimetres in diameter had been palpated in both instances The results of the study demonstrate the limitations of the 2 methods—palpation against the probe and cholangiography—and suggests that these should be used in combination if the diagnosis of stone is to be as thorough as possible

Borgstrom, S , and Norman, O (1954) *Acta chir scand* , 108, 13

Malignant tumours

Treatment

Scope of radical surgery [illegible]

of the gall-bladder, of which 51 were demonstrated by operation and 17 were found at necropsy, (2) 15 cases of carcinoma of the extrahepatic biliary ducts, of which 5 were established by operation and biopsy, 8 by operation followed by necropsy, and 2 by necropsy alone; and (3) 20 cases of carcinoma of the ampulla of Vater, established by operation (and biopsy only) in 10 cases

cases The series comprised

bladder and ductal tumours

the average duration of biliary tract symptoms in the 3 groups was 5·3 years, 2·6 years, and less than 1 year (5 cases)

creatico-duodenal tissues

the results in these cases led to the following conclusions: pancreato-duodenectomy, or other similar but more extensive radical resection, is indicated in all ampullary cases in which excision of the gross tumour seems initially possible, ascending cholangitis has not been a clinical problem, although usually found at necropsy, radical surgery does not greatly improve the prognosis in gall-bladder and ductal cases; prophylactic cholecystectomy appears reasonable for older patients with symptomatic biliary-tract disease, on the basis of the dangers of malignancy.

Glenn, F , and Hays, D. M (1954) *Surg Gynec. Obstet.*, 99, 529.

Common bile-duct obstruction

Surgical management

WEINBERGER (1954) describes the surgical management of extrahepatic benign, non-calculous common bile-duct obstructions. He reports 6 cases. The first was a man aged 68 years, in whom a gastro-intestinal series showed a duodenal ulcer penetrating the pancreatic head. Laparotomy revealed a distended calculous gall-bladder and a dilated common duct, also with calculi, indicating a stricture of the duct continuous in origin with the duodenal disease After opening the gall-bladder and removing the stones, cholecystoduodenostomy was performed to by-pass the stricture. A catheter was sutured into the common duct. This type of obstruction emphasizes the r

pressive cholecystoduodenostomy. Ca

tive jaundice At laparotomy, a disea

dilated common duct had an impac

choledochotomy incision, into which a T-tube was inserted She was discharged with this tube *in situ*, from this, oozing of bile later occurred. Her stools became clay-coloured. On readmission, tests indicated progressive obstructive, jaundice, and hepatocellular damage. Four weeks later, at re-exploration, the common duct was opened A probe reached but did not traverse the ampulla. Duodenotomy showed a stricture at the end of the common duct. The sphincter of Oddi was divided and a catheter passed through the ampulla into the duodenum. This case illustrates stricture of the common duct secondary to ulceration from an impacted stone, and the advantage in treatment of the combined transcholedochal and transduodenal approach. Case 3, a man aged 49 years, had upper abdominal pain, pruritus and fever 6 months after cholecystectomy, at which a rent in the common duct had been made and repaired by suture. On readmission, exploration showed a dilated duct

was opened below this, the stricture exposed and transverse resection performed, with end-to-end suture. Case 4 was a man aged 51 years upon whom cholecystectomy had been performed Laparotomy revealed the common duct as a long and functionless fibrosed strand Ultimately, a small, bulbous swelling was discovered at the junction of the hepatic ducts The patient's condition necessitated a rapid by-pass operation and a direct hepaticoduodenostomy was performed These two cases of surgical stricture illustrate the most serious problems in non-malignant obstructions The methods of repair depend upon the anatomy

Weinberger, H. A. (1954) *Amer. J. Surg*, 88, 585

Complications following choledochal sphincterotomy

Acute pancreatitis

BLATHERWICK and PATTISON (1954) describe acute pancreatitis after choledochal sphincterotomy. The operation is designed to give adequate drainage to the common duct The writers discuss three fatal cases of acute haemorrhagic pancreatitis developing after the operation. The first was a woman aged 58 years who had had pain for two months in

was opened and the sphincter incised to permit passage of a 7-millimetre probe A short T-tube was placed in the common duct and the operation concluded A piece of liver removed for section showed some fatty infiltration About 24 hours later she became severely shocked with a blood pressure of 60/zero The blood analysis was 8,000 units Improvement occurred after blood transfusion but only for a time, the patient died on the second day At *post mortem* serosanguinous fluid was found in the abdomen and extensive fat necrosis. The pancreas showed marked haemorrhagic degeneration in the body and tail but its ducts were clear, and there was no bile or duodenal contents in the pancreatic ducts The splenic vein was thrombosed throughout its course along the pancreas Death was attributed to acute haemorrhagic pancreatitis The other cases were similar. In cases operated on since, these careful amylase studies were made after the intervention, and in two, one with retained common duct stones and stenosis of the sphincter, and the other with pancreatitis and stenosis, the amylase was normal, but a third patient, without clinical signs of pancreatitis, showed definite amylase alterations

Blatherwick, N. H , and Pattison, A. C (1954) *Amer J Surg*, 88, 129.

Atresia of the common bile duct

Surgical treatment

admitted with progressive jaundice and frequent, light-coloured, loose stools The liver was palpable, the icteric index 50 units, the urine positive for bile On exploration, the gall-bladder and lymphatic ducts were intact but no distal common duct could be identified Cholecystoduodenostomy was performed Recovery was satisfactory until the ninth day, when the wound was found dehisced into the peritoneum After repair, recovery proceeded Urobilinogen became normal and the serum bilirubin diminished The second case was a male infant aged 8 weeks with jaundice persisting from birth The liver was palpable, stools and urine negative for urobilinogen, the icteric index 40 units On exploration, a distended gall-bladder and common duct were found Normal saline, injected into the latter, could not be forced into the duodenum An anastamosis of the gall-bladder and the first part of the duodenum was performed Within 6 days, urobilinogen was present, the icteric index 14 units, serum bilirubin 1 7 milligrams per cent At 3½ years he was completely normal Another male child aged 8 weeks presented with progressive jaundice, suggesting icterus

per

duc

four... patient, a girl aged 5 months, the gall-bladder, cystic and common ducts were

rudimentary, the hepatic ducts and systemic bile absent. The condition was inoperable and she died at 19 months. These cases are probably unique in a short period and do not justify statistical conclusions.

Bruton, O. C., Seeley, S. F., and Kanter, A. J. (1954). *Amer. J. Surg.*, 88, 660.

Surgery of the biliary tract

Post-operative extravasation

Extravasation of bile after operations on the biliary tract is discussed by McKenzie [illegible]

a drainage tube; and (5) seepage through a suture line. It is often impossible to determine the site of leakage; no source could be found in 12 of the present series A study of the clinical features indicated 2 distinct groups: (1) 7 patients who had an acute onset with shock; and (2) 13 patients who had a subacute or insidious onset and course. One of the most important features of the second group was the latent period; although many patients developed symptoms 4–5 days post-operatively, others made no complaint for periods of [illegible] abdominal pain was present in 16 cases [illegible] abdominal distension; mild jaundice, in [illegible] r original operation; elevation of the [illegible]

meticulous technique in cholecystectomy and choledochostomy; the correct treatment [illegible] extravasation is its early evacuation and drainage of the abdomen, and without early drainage the prognosis is bad. There were 7 deaths in the series.

McKenzie, G (1955) *Aust N.Z. J. Surg*, 24, 181.

Methods of examination

Cholecystography

[illegible] the cystic and common bile ducts is described by Harrott [illegible] minary skiagram is taken with the patient in the left [illegible] estricted for the midday meal and excluded for the [illegible] tablets of Telepaque are given at 11 p m ; no further food or [illegible] the dye has been taken, the patient is x-ra[illegible], with 15–20 [illegible] of the spine and if the concentration of the [illegible] right [illegible] acidity [illegible] be [illegible]

Harrott, Hilda M. (1954). *Radiography*, 20, 244.

Use of Cholografin

Gershon Cohen and his associates (1954) describe a new material for use in the radiological examination of the biliary passages. After intravenous injection this preparation, called [illegible] and gall-bladder, and even with [illegible] by stone [illegible] of iodine [illegible] ction and [illegible] one-tenth [illegible]

passes through the kidneys. The usual methods of preparation are followed and a 20 per cent aqueous solution almost isotonic with blood is used. Local irritation and general

before the

20 minutes,

ecessary. If

Gershon Cohen, J., Orloff, T. L., Sklaroff, D. M., and Cohn, E. M. (1954). *Amer. J. Roentgenol.*, 72, 801.

Value of Chlolografin.—GLENN and his co-workers (1954) have performed intravenous

full dose of 20–40 millilitres is injected Toxic reactions are minimized by injecting the agent slowly over an interval of 5–10 minutes Skiagrams are made in the postero-anterior projection, with the patient prone and the right side elevated about 30 degrees from the table The first skiagram is made 15 minutes after the injection is finished and another 5 minutes

and 31 had milder reactions, none developed thrombosis of the injected vein or local reaction in the antecubital space In one patient, whose gall-bladder had been removed, a short segment of the pancreatic duct filled by reflux, this is the first time, as far as the authors know, that this structure has been visualized without the use of catheter or cannula The method, especially when supplemented by tomography, may be of value in cholecystectomy, for use in children, in emergencies, when tumour is suspected near the porta hepatis, and when oral cholecystography fails or is not feasible

Glenn, F., Evans, J, Hill, M., and McClenahan, J. (1954) *Ann. Surg*, 140, 600

Cholangiography

explorations and obviates secondary operations Despite these advantages it has not been fully employed The present study includes 158 cases where cholangiography was undertaken before choledectomy or other pertinent surgery Operative cholangiograms number 171, post-operative, 234 In the normal anatomy of the biliary tract there are 2 right hepatic ducts, the ventrocranial and dorsocaudal The distal portion of the common bile duct narrows as it traverses the duodenum, having an average width of 2 23 millimetres; the average length is 13 01 millimetres The pancreatic duct may open separately into the duodenum or, rarely, may be absent In such cases cholangiographic filling of the duct is impossible and is not necessarily related to spasm of the sphincter of Oddi In this series 96 cholangiograms demonstrated abnormal

complete Tumours are only infrequently demonstrated, of 8 in this study, 7 were carcinomas Differential diagnosis from calculi is difficult. The ideal cholangiogram should outline the whole biliary tract, but the incidence of unsatisfactory results is high, due, in the authors' opinion, to lack of interest and co-operation by the surgeon, radiologist and anaesthetist. Roentgen exposure should be short and a high-voltage technique used A fractional system

of injection of contrast agent by syringe and needle into the duct or drainage tube is advocated Routine pre-choledectomy and post-choledectomy operative cholangiograms are called for.

Kantor, H G., Evans, J. A., and Glenn, F. (1955). *Arch. Surg., Chicago*, 70, 237.

Survey of current opinions of surgeons and radiologists.—CLARK (1954) surveys current [illegible] rile stated that it was "almost routine at [illegible] ve the answer". A questionnaire resulted [illegible] "excellent"; 39 surgeons and 17 radiologists as fair to useless". The author classifies his correspondents into [illegible]

[illegible] that it was as essential to ga[illegible] gastric resection. This opinion, however, [illegible] tioned Holt thinks it worth while, Hodes [illegible]

[illegible] radiologists, says that the quality of the films and the amount of time required to transport equipment is neither feasible nor justified and the number of cases insufficient to warrant ideal equipment.

Clark, C. W , Junr. (1954). *Amer. J. Surg.*, 88, 599.

[illegible]

1 millilitre of Biligrafin, 20 millilitres were injected. Films were taken in the prone and prone-oblique positions 15 minutes later Where the dye was satisfactorily excreted the common bile and hepatic ducts were clearly seen, their origins and branches less clearly. After 40 [illegible]

[illegible] ment Slight impairment included normal albumin globulin ratio, some increase in total globulin, slightly raised thymol and gamma turbidity Reversed albumin/globulin ratio meant moderate or severe impairment of function, while a markedly raised thymol and [illegible]

to have normal liver function and 7 slight impairment suggesting that the latter is not [illegible]

Samuel, E., Gluckman, J , and Barlow, J. (1955) *Lancet*, 1, 13.

GLAND-PUNCTURE AND ASPIRATION BIOPSY

See also B S.P., Vol 4, p. 297, S. Key 167.

Tumour diagnosis

Technique of trephine biopsy [illegible] The [illegible]

hand-operated drill is used to rotate a tooth-tipped trephine. The overlying skin only is given a minimal infiltration with local anaesthetic to enable a small stab to be made with a tenotome. The trephine with the trocar *in situ* is manually passed to the proximal limit of

Van Den Brenk, H A S (1955). *Aust N Z J. Surg*, 24, 217.

HAEMORRHAGE

See also B S P., Vol 4, p. 378, S Key 177.

Haemostasis

Value of prothrombin tests

DONALD and co-workers (1954) describe the significance of prothrombin tests in controlling haemorrhage The clotting defect which occurs in obstructive jaundice, hepatic

anticoagulants cause bleeding but in whom this symptom was due to very low levels of prothrombin itself and not of factor VII One patient, previously treated in hospital for myocardial infarction, was taking, after discharge, Tromexan twice daily A week before bleeding began clotting times were within safe limits, but when he developed severe haematuria his clotting time was 40 seconds, the prothrombin 5 per cent of normal Within a few

prolongation of the one-stage clotting time due to factor VII deficiency although their prothrombin readings were also low The Quick test is not a good measure of low blood prothrombin though this condition may play an important part in haemorrhages from liver disease or coumarin overdosage

Donald, A. C, Hunter, R. B, Tudhope, G. R, and Walker, W (1954) *Brit med J*, 2, 961

HAND

See also B S P, Vol 4, p 386, S Key 178

Dupuytren's contracture

Clinical features and treatment

HARRISON (1955) records a case of Dupuytren's contracture of the hands and feet A male

structures or extension into the toes, the affected portion of the aponeurosis was excised *en bloc* without difficulty, and the patient was walking well, without pain, 6 weeks later Histological study of the nodules showed cellular connective tissue with relatively little intercellular collagen, this stroma contained numerous clefts, and staining with Prussian blue revealed small quantities of free iron adjacent to the clefts

Harrison, M H M (1955) *Proc R Soc Med*, 48, 164

Extensor tendons

Treatment of recurrent dislocation

Recurrent dislocation of extensor tendons in the hand is discussed by WHEELDON (1954). A dislocation of a tendon of extensor digitorum from its median position on the metacarpal head during flexion of the metacarpo-phalangeal joint is a rare occurrence. Two cases are recorded in which the primary lesion was demonstrated, and operative repair satisfactorily performed In Case I, a boy aged 16 years had sustained a sharp blow on the dorsum of the proximal phalanges of the rig

the third metacarpal head h

phalangeal joint was flexed

Operation revealed an obliq

and aponeurosis to slip off the metacarpal head. The aponeurosis was sutured, but with

present for 13 years. The condition arises because of traumatic, congenital or pathological abnormalities in the shape of the extensor aponeurosis In a number of recorded traumatic cases, ulnar deviation of the affected finger was present when the dislocation occurred, and probably the coincidence of traumatic or congenital dislocation with arthritis deformans would hasten the development of the characteristic arthritis deformity. A haematoma and

Wheeldon, F. T. (1954). *J. Bone Jt. Surg.*, 36B, 612.

Minor injuries

Standardized methods of treatment

FLATT (1955) commenting on a series of minor hand injuries, has found that the use of standardized me

loss of working

intercede in the

of the wrist, the

distal insertion

obtained after immediate fine wire suture. Loss of knuckle skin was made good immediate rotation-advancement flap One case of multiple tendon cuts in the middle finger had considerable diminution of movement, but the loss was acceptable to the patient. The last case had a bad result after removal of the avulsed portion of the phalanx, and the author

stitute for the skin lost, and replacement of the palmar defect by a sp

fully serviceable repair. The result in repair of skin-flap injuries is conditioned by the base of

the flap If this is proximal, th the venous

return will jeopardize healing gnosis A

doomed flap should be replac doubt, the

devitalized area should be allowed to demarcate itself first All treatment carried out under local anaesthesia, very few patients being detained in hospital.

Flatt, A. E. (1955) *J Bone Jt. Surg.*, 37B, 117.

Industrial injuries

Management by the industrial surgeon

GODFREY (1954) discusses the early management of the injured hand by the industrial surgeon. He considers that this starts with the surgeon being constantly on the look out in the factory to eliminate hazards. Beginning with the finger tip, the first fracture encountered

is that of the tuft of the distal phalanx. With this, treatment of the soft tissues is often more

rarely need skeletal traction, but oblique fractures of the shafts often require it to accomplish and maintain reduction. Bennett's fracture of the base of the first metacarpal can usually be corrected by manual traction and manipulation with maintenance of the thumb in a hyper-extended and abducted position. With open fractures, restoration of the framework of the

e the best

repaired

Godfrey, J. D. (1954) *J. Amer. med. Ass*, 155, 1484

HEART AND PERICARDIUM

See also B S P, Vol. 4, p. 412, S Key 179.

Chronic constrictive pericarditis

Diagnosis and treatment

ROBERTSON (1954) describes the diagnosis and treatment of chronic constrictive pericarditis. He remarks that 40 years ago operations for this condition gave poor results but modern techniques have greatly improved the outlook When a thick shell of fibrous tissue forms round the heart it interferes with filling and emptying, thus causing venous distention and often enlargement of the liver with ascites, oedema and dyspnoea Surgeons dispute the mechanism involved, some attributing the greatest importance to liberation of the venae cavae where they enter the right auricle and others thinking that most benefit is obtained by permitting free movement to the ventricles. The writer shares the latter view while remarking that

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process has settled down. It is desirable to obtain a good exposure of the whole of both ventricles, and after the chest is opened the left ventricle is freed by dividing both pericardial layers down to healthy heart muscle The pericardial shell is removed by blunt dissection and if extrasystoles develop they may be controlled by better oxygenation, periods of rest and intravenous procaine Already, during operation, the pulse improves in volume but if the heart muscle bulges unduly it may be wise to operate in two stages, giving the muscle time to recuperate In some cases not only must the ventricles be freed but the venae cavae also.

Robertson, R. (1954). *Amer J. Surg*, 88, 76

HERNIA

See also B S P, Vol 4, p 428, S Key 180

Complications

Incarceration of a double loop

ROBERTS (1954) describes retrograde strangulation of the intestine from incarceration of a double loop. For many years surgeons had been puzzled by cases of apparently successful treatment of a strangulated hernia in a patient who later developed an artificial anus in the groin, but it was eventually found that two loops of bowel had become incarcerated at the

same time as in a case described by the writer. His patient, a man aged 72 years, had an operation for hernia 7 years before but needed to wear a truss for recurrence, this later became ineffective. When seen he was in considerable pain and had a right scrotal hernia

operation the bowel should be drawn down for complete examination of the parts gripped by the neck of the sac. The value of laparotomy is also evident and the prognosis in the elderly may prove quite good

Roberts, P A L. (1954). *Guy's Hosp. Rep.*, 103, 265.

Acute intestinal obstruction

MacKenzie, Schwartz and Robertazzi (1954) report on a case of perineal hernia causing acute intestinal obstruction The patient, a Caucasian male aged 68 years, had suffered from intermittent colicky lower abdominal pain for 5 days previous to his admission to hospital The pain had been accompanied by nausea and vomiting. On examination the patient appeared acutely ill, but not dehydrated. There were no relevant abnormal physical signs A straight skiagram of the abdomen revealed evidence of a ladder pattern of small bowel obstruction with fluid levels. Small bowel continuous suction and fluid replacement measures were instituted, but the patient had not improved by the following day. Laparotomy was performed and a herniation of the small intestine about half way along its length was revealed The herniation was into a defect of the pelvic floor between the bladder and the rectum, in the midline. The defect measured 4 × 2 centimetres. The bowel was dark red at the site of the hernia, but it was viable and was reduced into the abdomen. The defect was closed with interrupted cotton sutures. There had been no recurrence 18 months after the operation. The authors attribute the herniation to persistence of the embryonic pouch of Douglas.

MacKenzie, R J., Schwartz, I R., and Robertazzi, R. W. (1954). *Amer. J. Surg.*, 88, 354

Treatment

Results in 867 primary indirect inguinal hernioplasties

Palumbo and Mighell (1954) review the results obtained in 867 primary indirect inguinal hernioplasties performed upon 821 ... male patients with a follow-up period of from 1 to 6 years in 87· ... group in which a follow-up was obt ... within 2 years in 2 cases, and with ... plications The authors state that ... number of complicated cases. Twenty per cent of the patients who did not become ambulatory until the fourteenth day developed complications (69 patients). In a group of 588 patients who became ambulant on the first post-operative day only 5·2 per cent developed complications The recurrence rate was ... first day after operation (1 08 per ... the fourteenth day after operation. ... conclude that early ambulation effected a marked reduction in the incidence of post-operative complications without increasing the recurrence rate.

Palumbo, L T., and Mighell, S. J. (1954). *Amer. J. Surg*, 88, 293.

HERNIA—DIAPHRAGMATIC

See also B S P, Vol 4, p 451, S. Key 181.

Surgical anatomy

The crura of the diaphragm

... (1954) discuss the anatomy of the crura of the diaphragm and

main tendon and to some extent from the median arcuate ligament, and ...

operation

Collis, J L , Kelly, T D , and Wiley, A M (1954). *Thorax*, 9, 175.

INJURY—CIVIL AND INDUSTRIAL

See also B S.P , Vol 5, p 106, S Key 193.

Road accidents

Analysis of type of injury and vehicle in 717 cases

the greatest number of severe injuries and deaths The total number of deaths in the series

groups, pedestrians tended to have injuries to the legs The majority of pedestrian cases occurred at the 2 extremes of life and males predominated over females in all groups. The increased risk to the passenger was emphasized by the cases of motor-vans; of the 6 cases involved, only 1 was a driver

Aston, J N , and Perkins, T A (1954) *Brit. med J* , 2, 200

INTESTINES

See also B S P , Vol 5, p 121, S Key 195

Surgery of the colon

Technique

Modern techniques in the surgery of the colon are discussed by Coller (1954). Early diagnosis of a lesion of the colon and careful evaluation of the patient's condition are all-important The main advances in surgical techniques have been related to chemical and

physiological changes caused by d...
o
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ir ... high protein, high carbohydrate diet, with supplementary vitamins, especially ascorbic acid; parenteral administration may be necessary. The total blood volume and total red cell volume must be restored to the calculated expected ...
cases w
the valv
decomp
not sufficient, even if the ileocaecal valve is incompetent and caecostomy or transverse

has found that the most satisfactory method of anaesthesia has been induction by intravenous Pentothal Sodium followed by nitrous oxide and ether by a closed system. Curare-type muscle relaxants are rarely necessary with this method; control of anaesthesia and patient are provided by endotracheal intubation. The transverse incision, or modifications of it, is recommended for all operations on the colon, as causing least damage to the segmental nerve supply, absence of tension on the wound, and less post-operative pain. The post-operative care includes the prevention of pulmonary and thrombo-embolic complications There is no need to withhold food for long periods.

Coller, F. A. (1954) *Proc. R Soc. Med.*, 47, 1085.

Duodenal obstruction due to annular pancreas

Radiological findings and diagnosis

HOPE and GIBBONS (1954) present details of 8 cases of duodenal obstruction due to annular pancreas and discuss the diagnosis of this condition, with particular reference to the radiological findings. Of the cases presented 1 was in an adult and the other 7 were in neonatal infants; the latter were seen over a period a little less than 2 years. The cases demonstrate ... complete atresia

instances to lead to a presumptive diagnosis. In 2 cases of the series there was a concentric smooth narrowing ... dilatation of
the duodenum prox
tion is concentric o
diagnosis. An
significant. Ir
duodenal bul
beginning of
the "double-bubble" sign and they comment that it is what might be expected in cases of ... complete duodenal

and web-like obstructions of its lumen produce a narrow constricted zone as seen on a ... gram. They have so far not encountered a case of annular pancreas producing such a narrow zone of constriction. Moreover the majority of the duodenal bands they have seen have been across the third part of the duodenum A case of volvulus of the duodenum showed a charac- ... it is

Hope, J. W., and Gibbons, J. F. (1954). *Radiology*, 63, 473.

Ileostomy dysfunction

Mechanism and prevention

The mechanism and prevention of ileostomy dysfunction is discussed by CRILE and TURNBULL (1954). The authors' experience with the ilea stoma has led them to believe that

the excessive fluid loss is due to partial obstruction of the ileostomy itself; this causes dilata-

methods of treating dysfunction have been described; one of the authors observed the favourable effect of constant drainage, and devised a balloon retention tube for stubborn cases. The use of a skin-grafted stoma, in the prevention of ileostomy dysfunction, has been abandoned because of later contraction. It was thought that the dysfunction might be

tion necessitated tube drainage in 7 cases, and dehydration, hyponatraemia, hypochloraemia, and hypokalaemia were frequent

Crile, G , Junr , and Turnbull, R. B., Junr. (1954) *Ann. Surg* , 140, 459

Regional ileitis

History and morbid anatomy

granuloma of the ileum has been seen but the cause is unknown. Lymphangiectasis, or granulomatous lymphatic involvement, is a marked feature of the disease and in animal experiments sclerosis of the lymphatics of the mesentery have produced lesions resembling ileitis Other experiments in which finely divided silicates were given by mouth have produced convincing intestinal and regional lymph node lesions. Some writers think that

has proved disappointing and when surgery is required recurrences may occur after many years even though the whole of the affected area has apparently been removed

Crohn, B B , and Janowitz, H D (1954) *J. Amer. med Ass.*, 156, 1221.

Acute post-operative enteritis

Severe intestinal bleeding supervening

THOMA and SMOOT (1954) report a case of acute post-operative enteritis in which severe intestinal bleeding was a prominent feature A boy aged 9 years was admitted to hospital

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string suture There was no other pathological disorder During the operation, the patient received 500 millilitres of saline intravenously. He was returned to the ward in good condition, but 3 hours later went into profound shock. After receiving 1,000 millilitres of blood, which restored his blood pressure only to 90/60, the abdomen was reopened, but oo

polyposis of the intestine, primarily the small intestine, but the discovery of dark pigmented spots on the buccal mucosa and the skin of the lips often indicates the diagnosis. If the colon is involved *it is highly probable that the cause is malignant.* At laparotomy wide resection of the colon is the correct procedure, but if found in other parts reduction may sometimes be attempted successfully

Brayton, D, and Norris, W. (1954) *Amer J Surg*, 88, 32.

JAUNDICE

See also B S P, Vol. 5, p. 176, S. Key 202.

Surgical treatment

Value of operative cholangiography

when the gall-bladder was normal and its removal was not anticipated, as in hepatitis or in irresectable malignant obstruction of the bile-ducts When it was intended to remove the gall-bladder, the cystic duct was isolated and partly divided and a fine ureteric catheter was passed through the opening in the cystic duct into the common bile-duct, injections were then made through the catheter. When the gall-bladder was absent or the common duct was markedly dilated, a direct injection was made into the common bile-duct "Completion cholangiograms" were made by injecting contrast medium through the catheter which was

ography was found to be of value

Hoerr, S O (1954). *Arch Surg, Chicago*, 69, 432

JOINTS—INJURIES AND ACUTE INFECTIONS

See also B S P, Vol 5, p 195, S Key 195

Temporomandibular arthrosis

Traumatic causation

Incidence —HANKEY (1954) discusses temporomandibular arthrosis Since World War II, an out-patient session has rarely passed without seeing at least one case of temporomandibular dysfunction, the author has seen about 150 joint cases in the last 5 years. The word "arthrosis" is used in the present study to denote those symptoms and changes of the temporomandibular articulation which follow trauma, as distinct from those of congenital, inflammatory or neoplastic origin A review of the literature shows that investigators agree that overclosure or malocclusion of the teeth may seriously affect the mechanism of the temporomandibular joint, eventually causing an internal derangement or arthrosis with its complex symptoms, that there are other factors is evidenced by the variety of symptoms and by the fact that they occur in the presence of normal dentitions An *analysis of the author's* series of 150 cases shows that 76 per cent were female and 24 per cent male, the ages of the

closure, or arthritis, in 121 cases, the onset was gradual in 95 cases and sudden in 55 cases The main symptom in 85 cases was clicking of joints, in most cases unilateral and painless; other symptoms included reflex pain, and interference with the movements of the mandible

The series included very few ear symptoms or indications of Costen's syndrome. Anatomical study shows that the disc is composed of interlacing bundles of thick collagen fibres, on the upper and lower surfaces the fibres run parallel to the surfaces; investigators consider it to be capable of repair Blood vessels and nerves can be traced to the periphery; the loose tissue connecting the disc to the posterior capsule wall contains elastic fibres, and is very vascular. Exploration of the joint was necessary in only 14 per cent of the series The results of treatment, in 125 cases completed, were cure in 72 per cent, marked improvement in 20 per cent, and failure in 8 per cent The great majority of the cases were treated conservatively. The author emphasizes the prophylactic importance of extended orthodontic treatment of children and of conservative treatment of the teeth.

Hankey, G. T. (1954). *Brit. dent. J.*, 97, 249

JOINTS—TUBERCULOSIS

See also B S.P., Vol. 5, p 219, S Key 207.

Treatment

Chemotherapy

Streptomycin and PAS—The treatment of bone and joint tuberculosis with streptomycin and PAS is discussed by HALD (1954) Since 1949, the author has treated all cases of bone and joint tuberculosis with streptomycin, since 1950, all cases are given streptomycin combined with PAS A series of 120 patients have been followed up, and treatment has been given to a total of 373. In contrast to miliary tuberculosis and tuberculous meningitis, it is very difficult in the case of bone and joint lesions to produce objective findings; radiography, for example, the most important objective aid, is largely interpreted subjectively, but activity cannot be decided by radiography alone, and the results of radiological and clinical examinations must agree. Chemotherapy has been used, most often, in connexion with surgical treatment; without surgical treatment, streptomycin is used for intra-articular injections, and chemotherapy is also used when tubercle bacilli have been found in the urine, and in some cases of miliary spread, acute pleuritis, pericarditis and peritonitis. The dosage of streptomycin for adults has been 0·5 gramme, mornings and evenings, for 30–60 days, and larger doses in rare cases, and children have received 0 20–0·25 gramme daily, PAS has been given in doses of 10–14 grammes daily, usually for 14 days pre-operatively, the majority of patients receiving 1,000 grammes or more The spine was the predominant site of the disease in the majority (76) of the cases The operation most frequently performed on these patients was excision and evacuation, in 23 cases, vertebral fusion, with prophylactic streptomycin, was performed in 12 cases Of 15 cases of iliosacral joint tuberculosis, 8 were treated by arthrodesis and chemotherapy; all obtained primary healing, and the healing lasted In the ankle and foot lesions, the new chemotherapy was useful, although operations had been performed previously with good results The series included a group of cases of tuberculous glands and chest-wall lesions—costal and sternal caries Five out of 8 cases of tuberculous glands had sinuses, and 3 had, or had had, other tuberculous metastases, but were given chemotherapy mainly for the gland tuberculosis The author concludes from the results of the study, that streptomycin and PAS have in many ways altered the treatment of bone and joint lesions; they should not be used indiscriminately immediately the cases are diagnosed but should, in the first instance, be used as an aid during surgical therapy; they offered greater certainty of primary healing in operations in tuberculous tissue, and the treatment should be tried even in cases with chronic sinuses of long standing, operation in the first phase of the disease is justified in suitable cases, both in children and adults; without simultaneous surgical treatment, the drugs do not appear to influence, appreciably, the development and repair of tuberculous processes in bones, and they do not prevent occurrence of fresh metastases

Hald, J (1954) *Acta tuberc Scand*, 30, 82.

KIDNEY AND URETER—CYSTS

See also B S P., Vol. 5, p. 244, S. Key 208.

Renal cysts in the newborn

Reports of two cases

CHRISTESON (1954) reports two cases of simple renal cysts in the newborn. The first, a solitary simple cyst was matched by only 16 similar cases in the literature The second case was one of multiple simple cysts of the kidney, a much more common entity than the

many smaller cysts. A left nephrectomy was performed and the infant made a good recovery

Christeson, W W (1954) *J. Urol.*, 72, 1137.

Mega-ureter with vesico-ureteric reflux

Genetic factors

Mega-ureter with vesico-ureteric reflux in twins is discussed by STEPHENS, JOSKE and SIMMONS (1955) In a previous study, one of a pair of monovular twins with mega-ureter with reflux was described A study has now been made of the co-twin of this child, and also

tested, while those of the second pair showed unequivocal differences in 2 blood group systems. Vesico-ureteric reflux does not occur in normal children, in over 200 micturition cysto-urethrograms, it was observed only in mega-ureter, and to a slight degree in the terminal one-quarter of the normal calibre ureters in the high tension infantile bladder

Stephens, F. D , Joske, R. A , and Simmons, R T (1955) *Aust. N.Z. J. Surg* , 24, 192

KIDNEY AND URETER—GROWTHS

See also B S P , Vol 5, p 268, S. Key 210

Nephrectomy

Recurring symptoms due to disease of the ureteral remnant

MASON and COBURN (1955) describe disease of the ureteral remnant following nephrectomy and giving rise to subsequent persistent or recurring symptoms In conditions such as papillary carcinoma of the renal pelvis and carcinoma of the ureter, removal of the ureter at the time of nephrectomy is considered the operation of choice, but in renal tuberculosis, pyohydronephrosis and renal calculus, the advisability of total nephro-ureterectomy is controversial Latchem (1922) showed that in the absence of obstruction in the distal ureter, the ureteral remnant will atrophy with a collapsed lumen, whereas if obstruction is present, the lumen dilates Infection causes abscess formation and continued peristalsis Suspected disease in a ureteral remnant is confirmed by cystoscopic examination for pus exuding from the orifice, and by radiological examination of the stump Three post-nephrectomy cases with symptoms warranting secondary ureterectomy are reported The first, a woman aged 55 years, had sudden pain in the right flank 25 years after nephrectomy Catheterization revealed a calculus near the ureterovesical junction A ureteral segment containing the stone was removed. The second patient, a woman aged 23 years, presented with a draining sinus in the right

died from metastases

nephrectomy would p

cinoma It is indicate

ureter, impacted stones in the distal ureter, renal tuberculosis and ureterovesical obstruction.

Mason, J Tate, and Coburn, W A. (1955) *Arch Surg., Chicago*, 70, 280.

PART III—ABSTRACTS

KIDNEY AND URETER—HYDRONEPHROSIS AND PYONEPHROSIS

See also B.S.P., Vol. 5, p. 286, S. Key 211

Congenital hydronephrosis due to ureteropelvic obstruction

Surgical procedures

LICH and MAURER (1955) discuss the condition of congenital hydronephrosis, limiting themselves to hydronephrosis due to ureteropelvic obstructions. They consider that intrinsic abnormalities of the ureteral wall explain the majority of obstructions in this situation, and that accessory vessels and ureteral bands are not more than merely contributing factors to an obstruction caused by an intrinsic lesion They consider that renal ptosis might, in rare instances, account for pyelectasis, but have not recorded such an instance in their series. Their studies have provided no evidence that ureteral strictures might have been initiated by neurogenic abnormalities They describe the symptoms and signs of hydronephrosis and discuss the ancillary methods of diagnosis The statement is made that there are two basic fundamentals of all surgery in hydronephrosis. Nephrectomy of the damaged kidney should be carried out if the opposite kidney shows normal function, and, if both kidneys are damaged, the poorer kidney should be repaired first, followed in a short time by repair of the less disturbed kidney. The authors believe that some of the most satisfactory operative procedures for the correction of ureteropelvic obstruction are: (1) extra-ureteropelvic surgery such as division of aberrant vessels or bands and nephropexy; (2) pelvioureteroplasty; and (3) excision of ureteropelvic stricture with ureteral anastomosis. In regard to methods of plastic correction, the authors believe that the method employed is less important than the skill of the surgeon who uses it.

LICH, R., and MAURER, J. E. (1955) *J. Amer. med. Ass.*, **157**, 577.

Anuria

Complication of retrograde pyelography

GRIEVE and LOWE (1955) report a case of anuria following retrograde pyelography. The patient, a man aged 38 years, was admitted to hospital with right-sided abdominal pain Apart from deep tenderness in the right hypochondrium and renal angle he showed no abnormal physical signs His symptoms subsided spontaneously during the first day in hospital Cystoscopy and bilateral retrograde pyelography was performed a few days later. Subsequently the patient complained of severe pain in both renal angles. He had anuria for 3 days and then recovered spontaneously. The skiagrams showed extensive backflow into the substance of each kidney, and on the left side dye could be seen streaming towards the vertebral column. In discussing the cause of the anuria, the authors suggest that it might have been due to bilateral ureteric obstruction, to extra-renal uraemia, or to hypersensitivity to the contrast medium (Urodiodone). An intradermal test was, however, negative. As a further possibility they suggest that the anuria might have been due to interstitial oedema of the kidney due to the considerable backflow which occurred. The authors do not consider reflex anuria to be a possibility "as it has recently been discounted as an entity" (Miller, 1952) The presenting symptoms leading to the initial admission to hospital were not satisfactorily explained.

GRIEVE, J., and LOWE, K. G. (1955). *Brit J Urol*, **27**, 63.

KIDNEY AND URETER—STONE

See also B.S.P., Vol. 5, p 297, S. Key 212.

Impacted ureteric calculus

Treatment

Cystoscopic incision of the ureteral meatus and intramural ureter—KIEFER (1954) advocates immediate cystoscopic incision of the ureteral meatus and intramural ureter when, during the manipulation of an engaged ureteric calculus, it becomes impacted at the uretero-vesical junction, or just above A loop catheter has usually been used by the author to engage the stone, and when larger stones become impacted, as they frequently do, meatotomy has been performed with the high-frequency current This has been accomplished by removing the cystoscope, a McCarthy instrument, leaving the loop catheter in place. The cystoscopic sheath has then been re-inserted next to the catheter, and the meatotomy performed with a Collings knife with an offset blade. A small Foley catheter has been left in the bladder for 24-72 hours, depending on the extent of the incision The procedure has been used in 13 cases

bringing the stone into the bladder.

Kiefer, J H. (1954) *J. Urol*, 72, 644

Mechanism of renal calculus formation

Results of animal experiments

BAKER and SISON (1954) have investigated the mechanism of renal calculus formation in rats by means of selective staining techniques The techniques employed were Von Kossa's stain for the demonstration of phosphates and carbonates, Hotchkiss' (1948) staining technique for polysaccharides, and a combination of these designed to show phosphates and carbonates at the same time as polysaccharides Calculus formation and renal calcification were induced in experimental rats by administration of parathormone Quantities of parathormone insufficient to cause calcification were found to produce alterations in the renal polysaccharides as demonstrated by the staining methods employed· there was a patchy increase in polysaccharide reaction throughout the renal tubules. In the brush border of the proximal tubules it was most markedly increased when full doses of parathormone were given, but in the animals given insufficient parathormone to cause calcification, changes in polysaccharide staining involved only the tubule basement membrane. Doses of oxamide insufficient to cause renal calcification resulted in a patchy increase of mucopolysaccharide staining in the renal tubules also This involved the basement membrane, the surface of the cells, and frequently the cells themselves contained polysaccharide staining material. Increased amounts of oxamide caused calcification to appear mainly within the lumina of the tubules, but some was seen in the basement membrane or the tubule cells themselves Most rats given large amounts of uric acid failed to produce renal crystals or stones The polysaccharide alterations were unpredictable but were similar to those observed in the parathormone and oxamine experiments The authors conclude that the changes observed in polysaccharide staining in the renal tubules were not due to tubular injury produced by crystals or stones in the tubules, but rather to renal tubular ground substance alterations

in polysaccharide staining nor in phosphate-carbonate staining were observed in the glomeruli of patients or experimental animals The authors conclude that renal calculus disease is apparently entirely a tubule process

Baker, R , and Sison, F (1954). *J Urol.*, 72, 1032.

Modification of urinary surface tension

Administration of oral glucuronic acid

HARLIN and WIESEL (1954) report some observations on the modification of urinary surface tension by administration of oral glucuronic acid and discuss its application in the prophylaxis of urinary calculi Glucuronic acid is one of the end-products in the urine of

developed a persistent elevation to 72 dynes per centimetre; 5 patients with average initial surface tension values between 69 and 71 dynes per centimetre showed a fall in urine surface tension, but it is stated that in 3 of these the fall was only temporary, 11 patients whose base-line determinations were found to be in the range 70–73 dynes per centimetre responded to medication by maintaining surface tension levels within the range 66–69 dynes per centimetre. The authors state that it is evident from the above results that it was possible to lowe

by c

inst.

con

be r

form, Glucuronolactone.

Harlin, H C , and Wiesel, L (1954) *J Urol*, 72, 1046.

Ion-binding properties of electrophoretically homogeneous muco-proteins of urine

Comparison between normal subjects and those with calculus disease

BOYCE, GARVEY and NORFLEET (1954) have investigated the ion-binding properties of electrophoretically
with calculus disea
were demonstrated

[illegible]

concentrations of urinary muco-proteins of any subjects yet observed. One of the
proteins, which th
the *p*H range of u
demonstrated to
cubating solution contained phosphate ions in addition to calcium, a progressive formation of crystalline calcium phosphate followed the appearance of the calcium-muco-protein precipitate. The authors comment that the muco-protein in fraction I of calculous disease

[illegible]

calcinuria *per se* should be considered as a possible stimulus in the increased production or activation of urinary ion-binding muco-proteins. Pathogenic bacteria or injury may also facilitate the binding of calcium ions by muco-proteins.

Boyce, W. H., Garvey, F. K., and Norfleet, C. M. (1954). *J. Urol.*, 72, 1019.

Mechanisms of the formation and control of calculus disease by the kidney

Clinical and laboratory research

HOWARD (1954) discusses clinical and laboratory research concerning mechanisms of formation and control of calculous disease by the kidney. He considers that it is a reasonable hypothesis that under a given set of circumstances already conducive to stone formation, the tendency for such cohesions to occur would be enhanced if the principal substance forming the crystals were increased in amount. Likewise, that if the local conditions favouring

[illegible]

no condition in which excessive calciuria exists in which extensive skeletal breakdown is not

[illegible]

may even have added force to the tendency towards lime crystallization in the urine. During studies on the matrix of bone it became apparent that this calcifiable substance contained material with characteristic staining reactions—it was metachromatic to toluidine blue, showing it to be a highly polymerized sugar, and it stained positively with Hotchkiss periodic

[illegible]

in the formation of urinary calculi. The author concludes by discussing some of the advantages to be gained by analysis of the stone in patients with renal calculi, by testing the urine for cystine, by determining the presence or absence of excessive calcium excretion, and by determining the characteristics of urinary infecting organisms.

Howard, J. E. (1954). *J. Urol.*, 72, 999.

KIDNEY AND URETER—TUBERCULOSIS

See also B.S P., Vol. 5, p. 307, S. Key 213

Obstruction of the ureter and its pelvis due to tuberculosis

Treatment

LANE (1955) presents some observations on renal tuberculosis. Dealing with the problem of obstruction of the ureter and its pelvis, the author states that the highest early obstructive lesion is the "pinched off" calyx: chemotherapy alone may free the urinary tract from infection in these cases and partial nephrectomy may not be necessary A much rarer obstruction is stricture of the pelvis itself and unless this condition is treated the kidney will be slowly destroyed The ureter may be obstructed at any level but the commonest site of stric-

seriously affected cases of contracture of the bladder the author has tried cystoscopic over-distention of the bladder in patients without a vesico-ureteric reflux. The bladder is distended with water until the mucosa cracks or until multiple petechiae appear Four out of 6 cases benefited and the author intends to give the method a further trial. He refers to the problem of vesico-ureteric reflux and states that once it is established in a tuberculous case it is permanent and there is no treatment for it It may be significant, he comments, that a ureteric specimen of urine may be contaminated from the bladder in the presence of reflux

Lane, T. J D. (1955) *Brit J. Urol*, 27, 27.

LIVER—CIRRHOSIS

See also B S P , Vol. 5, p. 437, S. Key 223

Portal hypertension

Treatment

The present rational treatment of portal hypertension is discussed by NANSON (1954) There are 3 types of obstruction pre-hepatic, intra-hepatic and post-hepatic The first type represents obstruction in the portal vein itself, portal vein thrombosis may be acute, producing a surgical emergency which is usually fatal, but more commonly occurs as a quiet antenatal or neonatal condition The blocking of portal venules in the portal tracts is usually secondary

with adequate liver function, a porto-caval end-to-side anastomosis is the treatment of choice. Any shunt procedures are contra-indicated by ascites and poor liver function, until liver function is normal or near normal, if haematemesis is likely to prove fatal, a direct attack on the varices should be made, and a shunt performed later. Two recent developments in the treatment of hepatic coma consist in the administration of glutamic acid and aureomycin

Nanson, E M. (1954). *Aust N.Z J Surg*, 24, 98.

MOUTH AND PHARYNX, MALIGNANT DISEASE OF

See also B S P , Vol 6, p 82, S Key 234

Malignant disease of the upper jaw

Treatment

The treatment of malignant disease of the upper jaw was the subject of a discussion at the Section of Surgery, Royal Society of Medicine (1955). It was emphasized that decision

of previous investigators. Experimental injury to the periosteum failed to produce ossification in the muscle The results of the experiments support the metaplastic theory of myositis ossificans A study was also made of 5 male patients with localized myositis ossificans; the average age of the patients was 30 years, and, with the possible exception of 1 case the lesions were unconnected with bone. The results of morphological study of these cases also support the view that these lesions are of metaplastic origin

Constance, T. J. (1954). *J. Path. Bact*, 68, 381

NEOPLASMS—INNOCENT AND MALIGNANT

See also B S.P., Vol 6, p 194, S Key 240

Latent carcinoma

Latent carcinoma is discussed by FRANKS (1954) There are 3 different patterns of tumour growth. (1) the rapidly growing tumour which soon kills the patient, perhaps within the first year; (2) the slow growing tumour which may be present for many years and which may not even be an immediate cause of death; and (3) the latent carcinomas The first 2 groups are well recognized In a study of latent carcinoma of the prostate, the bladder, prostate and rectum were removed in one piece from 220 males, the series was unselected, with the exception of excluding 1 case of clinically diagnosed carcinoma The whole of the prostate and its surrounding tissues were examined histologically There were 69 carcinomas, that is, about 30 per cent, or 37 per cent in men over the age of 50 years; the apparent dis-

cinomas and 2 larger ones were found in a comparatively short time, 4 of these, beginning in the main lower bronchi, were found to start as intra-epithelial carcinomas, and the remaining 11 were associated with scars near the periphery of the lungs Small tumours—the

disease), and in the cervix, have been described The reason why these tumours remain latent is unknown, although some of the causes of latency can be recognized in experimental animals The author assumes that regression and progression are phases of the same process; if the factors causing progression are removed, the tumour regresses and may remain latent, the tumours being dependent on some factor or factors for their continued growth

Franks, L M (1954) *Ann R. Coll Surg, Engl*, 15, 236

Carcinoma of the mastoid cavity

Case report

JONES (1955) reports a case of carcinoma in a mastoid cavity The patient, a male aged 39 years, had suffered for 30 years from bilateral otorrhoea, particularly on the right side, aural polypi had been removed on many occasions A right radical mastoidectomy was

ment in the local and general condition A facial palsy developed, there was considerable bony erosion, and the patient died from meningitis The author mentions 4 similar cases which have been reported in the literature

Jones, H. M. (1955) *J Laryng*, 69, 140.

treated surgically These cases were seen within a period of 8 months, at a thoracic surgical unit dealing with a regional area of 250,000 people. The series comprised a woman aged 65 years, and 2 men, aged 53 and 52 years respectively. The diagnosis was not suspected, at first, in any of the cases; in all, however, it was established later, and operation was followed by complete recovery. The early diagnosis made in the 3 cases were: haematemesis secondary to a foreign body in the lower third of the oesophagus; acute pancreatitis, or rupture of the gall-bladder, and perforated duodenal ulcer. The findings in these cases indicate that spontaneous rupture of the oesophagus is an acute emergency which must always be borne in mind, and which may simulate many lesions, including coronary thrombosis and acute abdominal catastrophes; frequently, the patient is too distressed to give a rational history The oesophagus may perforate into the mediastinum alone, into the right or left pleural cavities, or into both, and so may produce a diversity of signs and symptoms; it is often difficult to elicit definite chest clinical signs. Cervical emphysema may be absent, but if present it is a diagnostic sign. The diagnosis is confirmed by radiological examination of the chest, including, if necessary, the swallowing of radio-opaque oil. The essentials of pre-operative management comprise prompt relief of any tension pneumothorax; restriction of all food by mouth; intravenous fluids; passage of a Ryle tube to the stomach; and antibiotics. Thoracotomy should then be performed, and the rent should be sutured if possible; in early cases, healing is sound and convalescence is greatly shortened. The author recommends that a radiograph of the chest should be included in cases of difficult diagnosis of acute abdomen

Borrie, J (1955) *Brit. med J.*, 1, 23.

Surgical exploration

A case of spontaneous rupture of the oesophagus is recorded by BOULLE (1955). A woman, aged 73 years, complained suddenly of severe upper abdominal pain which rapidly spread to both sides of the lower chest and back, 30 minutes later she vomited a little blood-stained fluid and then collapsed with pain. She had a long history of dyspepsia, which she relieved by making herself vomit Examination, on admission to hospital, showed the patient to be very obese, and greatly shocked, marked surgical emphysema of the front of the neck; equal aeration of both lungs, and no effusion or pneumothorax. A Ryle tube was passed and 90 millilitres of thick, blood-stained material was aspirated Radiographs of the chest were taken, and after a barium swallow these were repeated The radiological examination showed the Ryle tube folded on itself in the oesophagus there was marked widening of the mediastinum, with much free gas; there was slight collapse of the medial lung substance at both bases and a very little free pleural effusion at each side, but no pneumothorax; barium had passed into the posterior mediastinum Operation through a right thoracotomy failed to locate the tear, but the left side of the lower oesophagus could not be seen satisfactorily from this approach A wide-bore stomach tube was passed, without revealing the tear; the chest was closed after inflating the right lung The condition of the patient deteriorated and she died 48 hours post-operatively, necropsy revealed a vertical tear, 2 inches long, in the left posterior aspect of the oesophagus Microscopical study of oesophageal tissue showed no signs of pre-existing disease

Boulle, J. R (1955) *Brit. med J*, 1, 25.

PANCREAS

See also B S P., Vol 6, p 433, S. Key 257.

Hyperinsulinism

Treatment

Pancreatectomy —A case of hyperinsulinism treated by partial pancreatectomy is recorded by KAHAN (1955) A male patient aged 38 years complained of attacks of "light-headedness", and inability to concentrate He had been taking phenobarbitone, for the treatment of petit mal, for the past 20 years Electroencephalography produced a record indicative of idiopathic epilepsy. Exploration of the pancreas revealed no tumour, and subtotal pancreatectomy was performed. A glucose drip was given from the commencement of the operation. comparison of blood-sugar curves indicated that the operation had prevented the fall of blood sugar after the first hour of continuous intravenous infusion. Study of 30 sections of the excised part of the pancreas revealed no abnormality The case is unusual in that the attacks were not invariably associated with a very low blood sugar and were not dramatically relieved by giving sugar

Kahan, A (1955) *Proc. R Soc. Med*, 48, 150

Carcinoma causing jaundice

Evaluation of methods of diagnosis and treatment

Carcinoma of the ampulla of Vater and of the head of the pancreas causing jaundice is discussed by PUESTOW, WURTZ and OLANDER (1954) A study was made, to evaluate methods of diagnosis and treatment, of the 48 cases of this type admitted to hospital from 1946 to 1951 inclusive; the series comprised 37 proved cases of carcinoma of the head of the pancreas and 11 proved cases of carcinoma of the ampulla of Vater The ages of the patients averaged 57·7 years Carcinoma of the head of the pancreas comprises four types: (1) adenocarcinomas of duct cell origin; (2) acinus types; (3) mucocystadenocarcinomas; and (4) islet cell carcinomas; the latter two types are rare Carcinomas of the ampulla of Vater are usually nodular or annular, firm, white, fibrous and infiltrative. The diagnosis of neoplasm in the region of the head of the pancreas may be difficult because of anatomical inaccessibility, the lack of conclusive tests, and the variety of symptoms. The 3 predominant symptoms in

difficult to obtain, but they are essential in indicating the treatment to be given; biopsies of

performed in small tumours of the pancreatic head, proved by biopsy, without metastases. Early ampullary carcinomas may be treated by local transduodenal excision; if the entire tumour cannot be removed by local excision, radical pancreaticoduodenal resection is indicated and may be carried out in 2 stages in poor-risk patients.

Puestow, C B., Wurtz, K. G., and Olander, G A (1954) *Arch Surg , Chicago*, 69, 564.

Pancreatitis

Investigation of causative factors

BLOCK, WAKIM and BAGGENSTOSS (1954) describe experiments to investigate the factors

necrosis was found, the ducts and acini were dilated and there was an infiltration, mostly

Block, M A , Wakim, K G , and Baggenstoss, A H (1954) *Surg. Gynec Obstet.*, 99, 83

Changes observed in the duct

crea

oper

parts If it were shown that these became dilated in this disorder retrograde decompression would be good treatment. In a significant percentage of cases the duct of Santorini is the main or only channel in the tail, body and part of the head of the pancreas. The writers investigated cases seen in a clinic during 20 years, 16 patients in all with an average age of 55 years Ten of these patients took alcohol, some excessively. The history of the disorder was obtained in every patient and a diagnosis of acute or chronic pancreatitis had been made in 10 of them The history varied in duration from 2 days to 22 years and in several persons there were repeated attacks All 16 came to autopsy and the primary cause of death in 9 was chronic pancreatitis and in 2 choledocholithiasis. Extrapancreatitic abscesses and also those within the gland, cavities or pseudocysts were often seen and the ducts usually communicated with the larger spaces. About 50 per cent of the patients had a significant dilatation of the pancreatic duct close to the tail Dilatations in other parts of the duct were also frequent Thrombosis of the portal vein was present in 6 cases. In another 6 jaundice had occurred sometimes associated with stones in the common bile duct. Dilatation of the pancreatic ducts may occur from causes within or outside the lumen. It is difficult to assess the importance of pancreatic lithiasis in chronic pancreatitis and it appears likely that calculi form as a result of this disorder. It is noted that an obstructing stone at the ampulla may produce a common channel Sometimes spasm of the sphincter of Oddi obstructs the ampulla and sphincterotomy is a recognized method of treatment; but of all the known causes only 2, choledocholithiasis and ductal metaplasia can be related aetiologically to pancreatitis

Berens, J. J , Baggenstoss, A. H , and Gray, H. K. (1954) *Arch. Surg., Chicago*, 68, 723.

Surgical aspects

HOLT (1954) discusses some aspects of pancreatitis, an uncommon condition with an uncertain aetiology and a difficult diagnosis. Clinicians insist that it occurs in numerous forms and is responsible for many upper abdominal disturbances. Mayo Robson (1901) described a symptomatology which could not be bettered to-day. Comfort and his colleagues (1946) simplified the pathology of the various types, classifying them into acute, subacute, relapsing and chronic The pathology is probably the same in all, differing only in severity. Acute cases may present haemorrhage or necrosis Chronic conditions may result from a single destructive attack or from cumulative lesser attacks. Mellanby (1925) found the external pancreatic secretion to consist of water, sodium bicarbonate and enzymes, the two former stimulated by secretin, the enzyme produced by vagal stimulation. Later experiments revealed a second hormone, pancreazymin, and hormone control is now more generally accepted than vagal stimulation To evaluate pancreatic function, estimations of serum amylase and lipase, diastase, external pancreatic secretion and fat content of the stools have been made, together with the glucose tolerance test. A transient rise of serum amylase of over 500 units associated with an upper abdominal syndrome is pathognomonic of acute pancreatitis. The aetiology depends on whether or not there is a reflux of bile into the pancreatic duct, resulting from some obstruction at the sphincter of Oddi. This presumes a common opening of the bile and pancreatic ducts, an anatomical feature by no means constant. Some observers believe reflux of bile to be normal; other theories include obstruction of the duct, vascular factors, infection, trauma and the pancreatic secretion. The writer believes that if the acute haemorrhagic form is excluded, pancreatitis differs little pathologically, from acute parotitis or similar lesion of the submaxillary gland, and that there is no reason to regard the one primarily as an infection while refusing to accept the infection factor in the other. A simple threefold explanation of the majority of cases, therefore, is obstruction to the free flow of the juice, infection and an actively secreting pancreas Diagnosis is simplified by two fundamental factors that pancreatitis occurs in various forms, with varying symptoms; that it may be the cause of an upper abdominal syndrome. Acute pancreatitis at the onset may simulate biliary colic or a perforated viscus with an intestinal obstruction. Less dramatic cases present acute pain in either hypochondrium, pyrexia, vomiting and a palpable upper abdominal mass Treatment, until recently by laparotomy, is now conservative. treatment of shock, relief of pain, inhibition of pancreatic secretion, treatment of ileus, maintenance of electrolyte balance, control of glycosuria and diabetes, use of antibiotics and the treatment of localized abscesses. Pain, often intractable, generally yields to atropine or hexamethonium Ileus requires prompt treatment by gastric siphonage and intravenous fluids. Antibiotics are effective in infection, necrosis or abscess formation Chronic pancreatitis, often resulting from over-eating and drinking, requires regulated diet, sedatives, antispasmodic drugs and pancreatic extract. Surgical treatment aims at the relief of symptoms, but has little effect on the pancreatitis Recurrent attacks of pain have been successfully treated by division of the splanchnic nerves on one side and the thoraco-lumbar sympathetic chain on the other. Pancreatoduodenectomy has also proved effective

Holt, R. L. (1954) *Ann. R. Coll. Surg, Engl.*, 15, 34

Evaluation of treatment.—CRILE (1954) discusses the surgical treatment of pancreatitis. In spite of an imposing therapeutic armamentarium, he states, treatment is often ... difficult to evaluate the results because the course of the disease is

pain; the results are unreliable Choledochoenterostomy is of value in cases where the common bile duct is dilated Subtotal pancreatectomy has been suggested and used often but the results are only satisfactory where the disease is strictly localized to the body and tail

Crile, G. Junr (1954) *N Y St. J. Med*, 54, 2581.

Results of experimental production

Pancreatitis is discussed by MACKENZIE *(1954) who first described experimental methods* of producing this disorder It is generally accepted that obstruction of the duct in an actively secreting gland may cause this condition, the obstruction being due to oedema, calculus, tumour, squamous metaplasia in the ducts and other lesions It is accepted that acute and chronic alcoholism is frequently associated with this disorder for alcohol increases acid secretion in the stomach, and duodenitis which ensues may obstruct the sphincter of Oddi

pancreatitis The biliary tract was normal. Fat emboli have also caused the disease Both experimentally and under natural conditions such a pathology has been clearly established. It has been found that the rapidly developing vascular lesion seen in the dermal Schwartzmann reaction has its counterpart in haemorrhagic pancreatic lesions caused experimentally by injections of meningococcal or of *Echinococcus coli* endotoxin into the pancreatic duct, *the rapid diffusion of the toxins through the intact duct walls was observed A day later* intravenous injection of the same toxin caused the same local reaction and the experimental animals died soon after from haemorrhagic pancreatitis It was found that venous and capillary thrombosis regularly preceded pancreatic necrosis and haemorrhage A toxic aetiology of the condition is clearly proved. In a few cases acute pancreatitis follows trauma, often steering-wheel injuries in motorists The association of pancreatitis with virus and

MacKenzie, W. C (1954) *Ann R Coll Surg. Engl*, 15, 220.

Pancreatic cysts

Diagnosis and treatment

LAWTON and MOSSEY (1954) discuss pancreatic cysts on the evidence of 12 cases, all being pseudocysts or retention cysts Until it reaches a certain size the cyst is unlikely to cause

stomach and greater curvature, press the stomach to the right and displac
jejunal flexure downwards. Other appearances noted will d
In the cases described a diagnosis was not
additional condition such
of choice
be
mo
less,
dra
The
... be anastomosed ... often attempted ... fistula formation ... or anastomosed Neverthe-
may be anastomosed to the stomach, the duodenum or the gall-bladder. ... recently and frequently gives good results ... may result and internal

Lawton, S. E., and Mossey, R. O. (1954) *Arch Surg., Chicago*, 68, 734.

PARALYSIS—MANAGEMENT OF

See also B S P., Vol. 6, p. 445, S Key 258

Hemiplegia

Treatment

Reconstruction of the carotid artery.—EASTCOTT, PICKERING and ROB (1954) describe a case of intermittent attacks of hemiplegia treated by reconstruction of the internal d
artery The patient was a woman aged 66 years who, when
suddenly found her right arm and leg pow
could not speak or swallow
and was complete In the nex
same time. When seen in hos
245/115 and later fell to 190/
marked abnormality. A left
cerebral artery which only filled at its origin. ... was made and showed ... detected nor any other
was slow and the intracranial vessels filled poorly, thrombosis of the internal carotid
suspected. Later films showed some improvement in this It was thought that the attacks
were due to intermittent ischaemia in the tissues supplied by the left internal carotid At
operation she was anaesthetized, and her body temperature reduced by external cooling to
82 4° Fahrenheit The left common internal and external carotids were found adh
neighbouring structures around the carotid bifurcation. Th
was tied and a diseased segment was
between the common ar
attacks similar to those
chest and palpitation suc

Eastcott, H H G ... , and Rob, C. G. (1954). *Lancet*, 2, 994.

PEPTIC ULCER AND ITS COMPLICATIONS

See also B S P, Vol. 6, p 496, S Key 262.

Duodenal and gastric ulcer

Sex, racial and occupational distribution

JONES (1955) estimates that about 1½ million people in Engl
from peptic ulcer or give a history of
638,000 men are
immu
tion o
duode
be responsible for th
centur
occu
the
incid
able
a dec ... the death

the mortality from duodenal ulceration has remained fairly constant Peptic ulceration accounts for 1 per cent of all deaths. A survey revealed a high incidence of duodenal ulceration among doctors and a group of unskilled workers, but these findings were attributed

differ from those of duodenal ulcer. Perhaps modern methods of processing food and modern feeding habits have a bearing on the aetiology

Jones, F. A. (1955). *J. R. Inst. publ Hlth*, 18, 64.

Relationship between levels of acidity

The levels of gastric and duodenal acidity are discussed by ATKINSON and HENLEY (1955) They wished to determine the relationship between the two, with particular reference to the

Atkinson, M., and Henley, K. S (1955) *Clin Sci*, 14, 1

Late results of partial gastrectomy —WELLS and MACPHEE (1954) report the late results of partial gastrectomy for peptic ulcer in 75 patients who were operated on 10 or more years ago and who have been regularly examined ever since Treatment or operation to correct

Wells, C, and MacPhee, I W (1954) *Brit med J*, 2, 1128

Technique of subtotal gastrectomy —BARCLAY and MCINTYRE (1954) describe the technique of subtotal gastrectomy for gastric ulcer Local anaesthesia is employed and the abdomen

opened by a near-vertical incision. A modification of the Billroth I operation is the procedure of choice except in cases in which it is not found possible to obtain a satisfactory duodenal end for anastomosis. The omentum is divided below the gastro-epiploic arcade. The greater curvature of the stomach is mobilized, the pyloric end is isolated and the duodenum is clamped and divided. After the cardia is defined the stomach is clamped and divided obliquely by means of diathermy. The opening is closed and an end-to-end anastomosis is made between the stomach and the duodenum. In patients aged more than 70 years a comparatively conservative resection should be carried out. Conversion to a variety of the Billroth II operation is possible at almost any stage of the operation described by the authors. The indication for operation becomes urgent in cases of perforation, intractable pyloric obstruction and severe continuing haemorrhage. In a series of 64 cases of peptic ulcer the ages of the patients ranged from 21 to 77 years. The series consisted of 51 males and 13 females, a pronounced contrast to the sex incidence of peptic ulcer 40 years ago, when the condition occurred more often in females than in males. As for the results of the operation, 56 patients expressed complete satisfaction with the treatment, 2 patients complained of side-effects and the remaining 6 patients were dissatisfied with their condition. One instance of a "dumping syndrome" was recorded, but there seemed to be some doubt about the diagnosis. Few after-effects were observed, a phenomenon which was correlated with the good nutritional status of the population of New Zealand.

Barclay, S., and McIntyre, J. H. (1954). *N.Z. med. J.*, **53**, 396.

Duodenal ulcer

Surgical treatment

PRIESTLEY (1954) offers some reflections on the surgical treatment of duodenal ulcer. As indications for operation the author recognizes the conditions of acute perforation, subacute perforation, obstruction, bleeding, failure of response to medical treatment, or some question regarding whether a given lesion is actually a benign duodenal ulcer or a carcinoma at the outlet of the stomach. The author feels that in Great Britain surgeons have been guided in the selection of operation for patients with duodenal ulcer too completely by the incidence of recurrent ulceration. Probably the post-operative functional result and the nutritional status of the patient should receive more consideration. Conservative operations such as gastro-enterostomy and vagotomy may often be preferred for patients who have never had a very large capacity for food. If these people are subjected to partial gastrectomy the smallness of their appetite and capacity is often accentuated. The author also considers that conservative operations are advisable for patients with long-standing obstruction who exhibit low pre-operative acid values. For young patients with a strong family history of duodenal ulcer and high gastric acid values the author favours high gastric resection associated with bilateral vagotomy as a primary procedure. The author has learned that recurrence is a frequent prospect for this type of patient, and he considers that gastrectomy combined with vagotomy should offer "maximal protection" against this eventuality. As a standard operative procedure the author favours partial gastrectomy with severance of the duodenum distal to the ulcer and the establishment of a posterior Hofmeister-Polya type of anastomosis. In the post-operative phase administration of a graduated diet is commenced soon, so that the patient has achieved an adequate oral calorie intake by the end of the first week. Encouragement to increase gastric capacity is a later feature of the post-operative regime, so that the patients are able to eat three main meals a day. Patients are told to follow an ulcer-type diet for one month after operation and are then allowed to go on a general type of diet; they are advised to eat at fairly regular intervals.

Priestley, J. T. (1954). *Arch. Surg., Chicago*, **69**, 455.

See also B.S.P., Vol 6, p 544, S. Key 264.

PERITONEUM AND PERITONITIS

Ascites

Diagnosis

Paper electrophoresis.—KAY (1954) describes the value of paper electrophoresis of the serum proteins in diagnosing ascites. The literature in this field is small and the first wave of enthusiasm for the procedure is diminishing. If ascites is the predominant feature of a disease it is frequently due to hepatic cirrhosis or abdominal new-growth and distinction between these causes is often difficult. If the liver is chronically diseased the γ globulin usually accompanies a low or normal α globulin, but in malignant disease reverse proportions of these

substances are frequent. The values obtained in constrictive pericarditis or heart failure are

those seen in cancer and the second about double the cancer figures Intrahepatic secondaries give diverse patterns but subacute nephritis is often identified by high α-2 lipoprotein and reduction of all other protein fractions. The procedure used is not an easy one and the boundaries between the β and γ zones are notoriously poorly defined

Kay, H E M. (1954). *Brit. med J*, 2, 1025.

Biopsy specimens

Ruddock peritoneoscope and modified forceps

Hope (1954) describes a modified biopsy forceps for the Ruddock peritoneoscope. This has

take a biopsy from the liver or from a tumour, with the operating handles in the "up" position, or from the parietal peritoneum with the handles down

Hope, R. B (1954) *Amer J Surg*, 88, 677.

Primary retroperitoneal tumours

Incidence of specific types

Johnson, Searls and Grimes (1954) describe primary retroperitoneal tumours, which were first observed by Morgagni Growths arising from embryonic urogenital structures, connective tissue, lymphatics and from nerve tissue have been described as primary. Such benign tumours as fibromas, lipomas and leiomyomas found in this region often become

described in the literature are lymphomas, but sarcomas, lipomas, and neuroblastomas are also frequent The writers observed 75 cases of this condition, their highest incidence being

Malignant tumours in the retroperitoneal space have a grave prognosis, and only 21 out of 56 could be treated surgically Fifteen of these had no radiotherapy Survival was only for a few years

Johnson, A H, Searls, H H., and Grimes, O F (1954) *Amer J Surg*, 88, 155

PITUITARY TUMOURS

See also B S P, Vol. 7, p 35, S Key 268.

Treatment

ACTH in conjunction with surgery

Raaf, Stainsby and Larson (1954) have used ACTH in conjunction with surgery in 18 patients with neoplasms in the parasellar region It was thought that the normal pituitary-adrenocortical response to stress might be despersed if the parasellar area is damaged by

tumour growth or through trauma inflicted at the time of operation. In the first of the 18 patients removal of a chromophobe adenoma of the pituitary was followed by deterioration in the patient's condition due to swelling of brain tissue. A decompression operation and a tracheotomy were carried out, and ACTH was given: the patient recovered and the authors consider that ACTH probably facilitated the satisfactory outcome. They therefore decided that all patients with tumours in the parasellar area would be given ACTH before and after operation. In the average case 25 milligrams of ACTH were given intramuscularly every 6 hours during 1–5 days before operation, and the dosage was continued through the first 2–4 post-operative days, and then gradually reduced. There were ... which included 1 typical acromegalic patient ... particularly hazardous risk. Th... was lower ... st was less ... s, cerebral ... a smoothin...

Re...

... (1954) *J. Neurosurg.*, 11, 463.

PLASTIC SURGERY—CORNEAL GRAFTING

See also B.S.P., Vol. 7, p. 50, S. Key 269.

Use of special punch in corneal grafting

Technique

A technique of corneal grafting developed in New Zealand ... A clean disc is cut from the recipient corn... position by a corneal spl... A trephine guide, ... surface of the corn... trephine being use... notche... of t... the ... whic... arou... an ar... passes through a ... and down. A pair of forc... factured with absolute pre... paper. After the cornea ha... across the diameter of the ... ring. One edge of the punch is supp... punched out: a similar segment is ... edge of the punch as far as it wil... chamber. The punch is then cen... of the disc punched out in one p... splint, the previously formed s... removed after 14 days. ... The splint is

Pittar, C. A. (1954) *Amer. J. Ophthal.*, 38, 689.

POLIOMYELITIS

See also B.S.P., Vol. 7, p. 94, S. Key 274.

Muscle recovery

Tests on 149 patients suffering from paralytic poliomyelitis

SHARRARD (1955) has carried out tests of muscle power on each possible muscle of 149 patients suffering from paralytic poliomyelitis. The tests were carried out 10 times during a period of 3 years from the onset of the disease, using the Medical Research Council scale. Of the limb muscles, 3,033 lower and 1,905 upper limb muscles were originally affected, and the course of recovery in these muscles has been recorded. Of the lower limb ... remained completely paralysed, and were separate... found to be the same in ... rate in the fi...

children. The clinical impression that certain muscles recover more slowly than others is due to the high proportion of those muscles which are permanently paralysed, and those that recover do so at the normal rate. Using the Medical Research Council scale, the amount of recovery to be expected in any one muscle can be assessed at any time after one month

reatest at the beginning, and then
: muscles were moving up in their
of individual muscles had ceased
6 months, 90 per cent were per-

manently paralysed If other muscles supplied by the same spinal segment as the muscle in question are completely paralysed, this suggests that the anterior horn cells of that level

from onset, most of the paralysed muscles are in grade 2 or 3, recovery is likely to be almost complete, on the other hand, if a group of muscles shows no activity after 6 months, recovery is not to be expected

Sharrard, W. J. W. (1955) *J Bone Jt Surg*, **37B**, 63.

PROSTATE

See also B S P., Vol 7, p 133, S. Key 278.

Cancer of the prostate

Treatment

Diethylstilboestrol—FISH, HUDSON and JOST (1954) describe the treatment of prostatic cancer with large oral dosages of diethylstilboestrol A total of 105 patients was treated by a combination of orchidectomy and 500 milligram of diethylstilboestrol daily In 2 instances it was necessary to discontinue the drug The incidence of painfully enlarged breasts, of nausea and of vomiting was less than 10 per cent There were 6 cases who developed pro-

luced
One

patient with a large fistulous mass in the perineum healed after a few weeks' trial of high dosage In the other 2 patients, the local prostatic tumour shrank considerably, and the distant metastases apparently improved The authors have gained an additional impression that patients have been tolerant of high levels of oestrogen dosage, where they were intolerant of low dosage

Fish, G. W., Hudson, P B., and Jost, H M (1954) *J Urol*, **72**, 1222.

Endocrine therapy—CARROLL and BRENNAN (1955) discuss the role of endocrine therapy in carcinoma of the prostate They state that the only group of patients with carcinoma of the prostate who do not require endocrine therapy are those in whom the cancer has not extended beyond the capsule of the prostate. For these patients radical surgery is indicated, and the group is becoming larger since a more thorough search has been made for cases of carcinoma of the prostate Moreover, borderline candidates for radical surgery are now being included within this group as a result of vigorous endocrine therapy The authors state that conclusive evidence as to the relative value of combining endocrine therapy with orchid-

apparently does not activate the adrenal or pituitary gland

Carroll, G, and Brennan, R V (1955) *J Amer. med Ass*, **157**, 581

Adrenalectomy.—WHEELER (1954) reports on one case of advanced carcinoma of the prostate treated by adrenalectomy. In July 1949 the patient had a bilateral orchidectomy,

but in September of the same year the condition of his disease was unchanged and as a result [illegible]

region. As the patient's disease progressed it became obvious that a cure had not been obtained. Two months after adrenalectomy he developed a cutaneous metastasis in the right groin, and an osteoblastic density was noted in the second lumbar vertebra The patient died of metastases 15 months after the adrenalectomy. The author considers that it is debatable whether or not the various forms of treatment employed helped in palliation.

Wheeler, J. S (1954) *J Urol.*, 72, 934.

Clinical results —STAUBITZ, OBERKIRCHER and LENT (1954) present the clinical results of a series of cases of carcinoma of the prostate over a 10-year period. Of the 122 cases studied there were 121 whites and 1 Negro. The average age incidence was 67·56 years. The average time from onset of symptoms to performance of biopsy was 6·7 months The most common symptoms were frequency, nocturia, skeletal pain, and disturbance of the urinary stream Haematuria occurred in only 12 per cent of the cases. Adenocarcinoma was the most common pathological type and responded best to androgen control therapy: this type of treatment was used in 85 cases Acid phosphatase levels were elevated in 47 cases and normal in 63 [illegible]

[illegible] of androgen control therapy were classified into 3 groups determined by the type of treatment given In 23 cases without metastases treated by stilboestrol alone the average survival time [illegible]

tomy and oestrogens gives the greatest survival rates. Cases treated by androgen control methods had a 5-year survival rate of 56·47 per cent and a 10-year survival of 20 per cent. This is compared with the untreated cases with a 5-year survival of 10 81 per cent and a 10-year survival of 2·7 per cent

Staubitz, W J., Oberkircher, O. J., and Lent, M. H. (1954). *J. Urol*, 72, 939.

Techniques of prostatectomy

Treatment according to type of obstruction

ROSS (1954) refers to the number of operations for removal of the prostate. He emphasizes that since obstruction at the bladder-neck is due to various causes, treatment must vary, not only with each type of obstruction, but with each patient. Adenoma, carcinoma and "sclerosis" of the bladder-neck are among the obstructive causes. Wallace (1951) suggested that the amount of muscular tissue in the bladder-neck was the dominating factor. He found [illegible]

but in September of the same year the condition [illegible]

combined perineo-abdominal approach. The patient was maintained post-operatively on stilboestrol. In November 1951 the patient complained of oedema and pain in the right thigh. Examination revealed bilateral hard inguinal lymph nodes and a large mass in the centre of the abdominal incision: biopsy of these areas showed metastatic adenocarcinoma of the prostate. In December 1951, bilateral adrenalectomy was performed, using the Peet approach. A dose of 50 milligrams of cortisone daily was necessary for post-operative maintenance, and 2 desoxycorticosterone acetate pellets of 75 milligrams were implanted in the infrascapular region. As the patient's disease progressed it became obvious that a cure had not been obtained. Two months after adrenalectomy he developed a cutaneous metastasis in the right groin, and an osteoblastic density was noted in the second lumbar vertebra. The patient died of metastases 15 months after the adrenalectomy. The author considers that it is debatable whether or not the various forms of treatment employed helped in palliation.

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was 70 m[illegible]
metastas[illegible]
10 cases [illegible]
were tre[illegible]
25 cases with metastases survived an average of 65 months. In a group of untreated patients, 14 cases without metastases survived for an average of 19 months; 23 cases with metastases survived an average of 37 months. The authors conclude that the combined use of orchidectomy and oestrogens gives the greatest survival rates. Cases treated by androgen control methods had a 5-year survival rate of 56·47 per cent and a 10-year survival of 20 per cent. This is compared with the untreated cases with a 5-year survival of 10·81 per cent and a 10-year survival of 2·7 per cent.

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threatening either uraemia or urinary infection. The pain of retention may be relieved by inserting a Barker lumbar-puncture needle suprapubically and allowing the urine to drain through a fine rubber tube, while investigations and preparations are made. Until the patient

Gershom-Thomson cold punch. For carcinoma, perurethral resection is the operation of

poned. When performed, the perurethral method is the safest.

Ross, J. C. (1954) *Brit med. J.*, 2, 1201.

Prostatic obstruction

Surgical management

addition to these indications transurethral resection may be carried out for any case of moderate sized enlargement of the prostate, and also in cases of neurogenic bladder The indications which he gives for perineal prostatectomy are a small or moderate sized prostate, an open perineum, a prostate close to the perineum, potency "no concern", or a blocked suprapubic approach. A radical perineal prostatectomy is advocated for cases of carcinoma of the prostate where the gland is not fixed and where there is no evidence of metastases It is also advocated for occasional cases of tuberculous prostato-vesiculitis. The author states that there is no indication for retropubic prostatectomy if fundamental surgical principles are observed. He considers that suprapubic cystostomy is indicated when (1) it is impossible to introduce instruments into the urethra, (2) a two-stage procedure should be made of any prostatectomy; or (3) the condition of the patient does not justify definitive surgery.

Herbst, W. P. (1955) *J. Amer med. Ass*, 157, 579.

PULMONARY TUBERCULOSIS

See also B S P., Vol 7, p. 197, S. Key 281

Treatment

Age considerations in relation to thoracoplasty

Beaconsfield and his colleagues (1954) discuss thoracoplasty in patients over the age of 50 years, in whom the length and the expectation of life has rendered treatment for tuberculosis necessary. Provided that the disease can be controlled, these cases have a good prognosis.

The disease was far advanced in 24 patients, moderately in 31. Its duration had been over 2 years in 17 cases, from 1 to 2 years in 26, less than 1 year in 12 The average pre-operative period was 11 months Streptomycin was administered to 21 patients. Some of the patients had received previous treatment, but in 75 per cent thoracoplasty was primary and only preceded by rest Associated disorders, including myocardial damage, were present in 16 cases. In the cardiac group, 4 patients had a two-stage thoracoplasty of 6 to 7 ribs, 2 had a three-stage operation of 8 to 9 ribs Two patients had bilateral thoracoplasties, 4 had 4 or 5 ribs removed at a single stage, combined with apicolysis The remainder had the standard operation, with removal of transverse processes below the first. The operation was performed in 2 stages for 40 patients; in 3 stages for 9. Four patients died as a direct result of the operation. The results of treatment fall into 4 groups. (1) where there is cavity closure and persisting

but in September of the same year the condition of his disease was unchanged and as a result he was submitted to further operative treatment. A total prostatectomy, complete cystectomy with iliac gland dissection, and bilateral ureterosigmoidostomy was performed by the

the abdominal incision biopsy of these areas showed metastatic adenocarcinoma of the

region. As the patient's disease progressed it became obvious that a cure had not been obtained. Two months after adrenalectomy he developed a cutaneous metastasis in the right groin, and an osteoblastic density was noted in the second lumbar vertebra. The patient died of metastases 15 months after the adrenalectomy. The author considers that it is debatable whether or not the various forms of treatment employed helped in palliation.

Wheeler, J. S. (1954). *J. Urol.*, 72, 934.

was used in 85 cases. Acid phosphatase levels were elevated in

The authors state that judged by changes in acid phosphatase level orchidectomy with or without stilboestrol is superior therapy to stilboestrol alone. The cases receiving some form

methods had a 5-year survival rate of 30·47 per cent and a
This is compared with the untreated cases with a 5-year survival of 10·81 per cent and a 10-year survival of 2·7 per cent.

Staubitz, W. J., Oberkircher, O. J., and Lent, M. H. (1954). *J. Urol.*, 72, 939.

Techniques of prostatectomy

Treatment according to type of obstruction

He emphasizes

that a small
adenoma with poorly developed muscle was compatible with a Conservative treatment

through a fine

Gershom-Thomson cold punch. For carcinoma, perurethral resection is the operation of choice. Bad risk patients are those with some serious medical condition, complicated by acute retention and those with poor renal function. In both, a suprapubic operation is dangerous and unnecessary. Instead, a Riches catheter is inserted suprapubically and operation postponed. When performed, the perurethral method is the safest.

Ross, J. C. (1954). *Brit. med. J.*, 2, 1201.

Prostatic obstruction

Surgical management

HERBST (1955) discusses the factors involved in the management of prostatic obstruction He considers that an indwelling urethral catheter is often satisfactory initial treatment for a

addition to these indications transurethral resection may be carried out for any case of moderate sized enlargement of the prostate, and also in cases of neurogenic bladder. The indications which he gives for perineal prostatectomy are a small or moderate sized prostate, an open perineum, a prostate close to the perineum, potency "no concern", or a blocked suprapubic approach A radical perineal prostatectomy is advocated for cases of carcinoma of the prostate where the gland is not fixed and where there is no evidence of metastases. It is also advocated for occasional cases of tuberculous prostato-vesiculitis The author states that there is no indication for retropubic prostatectomy if fundamental surgical principles are observed. He considers that suprapubic cystostomy is indicated when (1) it is impossible to introduce instruments into the urethra, (2) a two-stage procedure should be made of any prostatectomy; or (3) the condition of the patient does not justify definitive surgery.

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PULMONARY TUBERCULOSIS

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Treatment

Age considerations in relation to thoracoplasty

BEACONSFIELD and his colleagues (1954) discuss thoracoplasty in patients over the age of 50 years, in whom the length and the expectation of life has rendered treatment for tuberculosis necessary Provided that the disease can be controlled, these cases have a good prognosis The use of anti-tuberculosis drugs and the increasing application of pulmonary excision have partially modified the indications for thoracoplasty, but it still has its place in surgery, although it should perhaps be performed with the diseased lung still *in situ* This investigation included 55 patients (men and women) over the age of 50 years, who were so treated in a 17-year period Their post-operative course was followed from 4 to 21 years The disease was far advanced in 24 patients, moderately in 31. Its duration had been over 2 years in 17 cases; from 1 to 2 years in 26; less than 1 year in 12. The average pre-operative period was 11 months. Streptomycin was administered to 21 patients Some of the patients had received previous treatment, but in 75 per cent thoracoplasty was primary and only preceded by rest ... dial damage, were present in 16 ... racoplasty of 6 to 7 ribs; 2 had a ... iteral thoracoplasties; 4 had 4 or ... The remainder had the standard operation, with removal of transverse processes below the first The operation was performed in 2 stages for 40 patients; in 3 stages for 9. Four patients died as a direct result of the operation. The results of treatment fall into 4 groups (1) where there is cavity closure and persisting

back pain, but in 1 patient pain was first felt in the hip. Muscle spasm was frequent and a disc space invariably showed narrowing with some lesion in the adjacent vertebrae. In some a central disc protusion occurred. It is thought a primary weakness of the disc, congenital or after injury leads to changes elsewhere. As the nuclear fluid material escapes from the disc the cartilage plate may fracture to form Schmorl's nodes, but if the pressure develops forward the tough anterior longitudinal ligament directs the force on to the vertebral bodies with consequent pressure necrosis. There is never anything to suggest abscess formation Recovery from the vertebral defect sometimes occurs, though slowly.

Lamb, D. W. (1954). *J. Bone Jt Surg.*, 36B, 591.

SPINAL CORD

See also B.S.P , Vol. 7, p. 572, S. Key 572.

Pott's paraplegia

Treatment

paraplegia is discussed by Nisbet
s been criticized adversely; in one
npression and, although the results
were not stated, it can be assumed that some patients who became permanently paralysed would have recovered if they had undergone spinal decompression. Paraplegia seldom

reduced the mortality from operation and clarified the cause of the paraplegia
shown conclusively that in Pott's disease the paraplegia is caused by spinal compression, and that rarely is it caused by any other process, this conclusion was supported by the
and the finding of a mechanical
ce of operation
ich must not be
in the series reviewed, suggest

Nisbet, N. W. (1954). *Lancet*, 2, 303.

Myelocele and meningomyelocele

Follow-up of 10 *cases*

Chambers (1954) followed up 10 cases operated upon for myelocele and meningomyelocele in early life
and for some the advantages

trol and inability to move the legs.
24 hours. Great care is needed to
determine the state of sphincter control in the first
and some think that if the sphincters are definitely impaired operation should rarely be performed In some cases an annular constricting band beneath the lamina is found immediately above the defect and this may produce

hydrocephalus if not divided The writer observes that a paralysed spina bifida case surely deserves as much care as a bad case of poliomyelitis paralysis.

Chambers, W. R (1954). *Amer. J. Surg.*, 88, 552.

SPLEEN—SURGERY OF

See also B S.P , Vol. 8, p 1, S. Key 308.

Banti's disease

Portal venography in the demonstration of veins suitable for anastomosis

Du Boulay and Green (1954) give an account of their experiences with portal venography in Banti's disease Venography has been carried out on 46 patients suffering from portal hypertension or portal stasis, or both The technique employed has usually been injection of one of the jejunal tributaries of the superior mesenteric vein exposed at operation; occasionally some other tributary vein of the portal system has been used. In the later part of the

a crude method it gives a good impression of the degree of stasis present in the portal system.

of streamlining of flow in the portal vein under the conditions employed The main value of the method was found to be the demonstration of veins suitable for anastomosis

Du Boulay, G. H., and Green, B (1954). *Brit. J Radiol*, 27, 423

Aneurysm of the splenic artery

Resection

Williams and Harris (1954) recorded a case of successful resection of a splenic artery aneurysm Although aneurysm of the splenic artery is an uncommon lesion, it is of great significance, as demonstrated by the fact that until 1942, out of 124 reported cases there had been only 20 survivals The treatment of the present case, an 8-centimetre aneurysm which had penetrated the substance of the body of the pancreas, was an instance of the

aneurysmal wall As a result of the course of the splenic artery along the upper border of the body and tail of the pancreas, many of these lesions will penetrate the organ but they rarely involve the vital head It has already been demonstrated that if the short gastric vessels are not disturbed, splenectomy is not essential in the treatment of the aneurysm The post-operative course in the present case was entirely uneventful, and although hypertension persisted the patient became asymptomatic

Williams, R. W , and Harris, R B (1954) *Arch Surg , Chicago*, 69, 530.

TESTICLE AND TUNICA VAGINALIS

See also B S P , Vol 8, p 174, S Key 320

Germinal tumour of the testis

Relationship of interstitial cell hyperplasia to urinary gonadotrophins, testicular atrophy and histological type

Umicker (1954) has studied the occurrence of interstitial cell hyperplasia in association with testicular tumours, and its relationship to urinary gonadotrophins, testicular atrophy

and the histological type of the tumour. The material for this study consisted of the clinical records, results of hormonal determinations, and tissue sections of 36 patients who had germinal tumours of the testis. The patients were all between the ages of 19 and 32 years except for 1 man aged 41 years. *Interstitial cell hyperplasia* was estimated by comparison of the number of Leydig cells per microscopic field of testes removed for germinal tumours with the number found in testes without tumours which exhibited similar tubular morphology. *Calculation of the absolute number of interstitial cells per testis was not possible.* Hyperplasia, when present, was found to be diffuse although large focal aggregates were often encountered. The seminiferous tubules showed retrogressive changes of varying degree. *The urine of each of 31 patients was examined for pituitary gonadotrophins and in 10 of* these the titre was elevated. The author states that there was no convincing evidence of a

and interstitial cell hyperplasia

gonadotrophins. Each of these

the 25 men who did not excrete

Leydig cell hyperplasia but 7 of these 10 men had no

tion with germinal tumours of the testis There appears to be a close correlation interstitial cell hyperplasia and the excretion of chorionic gonadotrophins, and there is no significant relationship between the hyperplasia and tubular atrophy or urinary excretion of *follicle-stimulating hormone*

Umicker, W. (1954), *J. Urol.*, 72, 895

Imperfect descent of the testis

Treatment

nt of cryptorchidism.

ctopic testis or hypo-

gical intervention and

rs give intramuscular

to transplant or remove a testis

nal;

the testis lc

I

Arch

Prentiss, R. J, Mullenix, R. B, Whisenand, J. M., *Surg., Chicago*, 70, 283.

Tumour of the vas deferens

Clinical findings

report of a

very

the vas

imour,

was found in a man aged 26 years, who

semen specimen, examined prior to admission, had

studied as an

revealed oligospermia; 3 months previously he had noticed a small painless mass in the

scrotum. On examination, the mass was palpable in the right spermatic cord and attached to the vas deferens; it measured 0·5 centimetre in diameter and was freely movable, firm, non-tender and smooth. The right testis felt normal; the left was atrophic and there was a moderate-sized varicocele Operation showed the mass lying in the right vas deferens, the vas near the testis, and the convolutions of the epididymis, were markedly dilated Segmental resection of the portion of the vas bearing the tumour was performed; semen from the proximal cut end of the vas was examined and found to contain sperm in large numbers with good morphology and motility The lumen of the tumour would not admit a thin probe Re-anastomosis of the vas has been followed by an improvement in the semen count The pathological diagnosis of the tumour was "ductal hyperplasia of the vas deferens"

Graham, J B, and O'Conor, V J (1954). *J. Urol*, 72, 946

Primary carcinoma of the epididymis

Diagnosis and treatment

COWEN (1954) adds to the literature a case of primary carcinoma of the epididymis, an embryonal teratoma. He comments that of 134 reported cases of primary tumours of the

culous epididymitis was made Streptomycin was given and the patient was discharged completely recovered. He was re-admitted in February 1950 for pain in the right groin and back Pyelograms showed a retroperitoneal extra-ureteral neoplasm and radiological examination of the chest showed metastatic pulmonary deposits A review of the microscopic section of the epididymis showed an embryonal carcinoma with trophoblastic elements An Aschheim-Zondek test revealed 400,000 units of anterior pituitary-like hormone per litre of urine, gynaecomastia was then noted The patient's condition steadily deteriorated and he died in March 1950. Post-mortem confirmation of the revised diagnosis was obtained. The author comments that confusion of diagnosis may occur in these cases due to the similarity of the malignant giant cells to those of tuberculosis, and also as a result of a misleading clinical impression

Cowen, R. (1954). *J Urol*, 72, 1224.

Tuberculous epididymitis

Treatment

Dihydrostreptomycin.—RIABOFF (1954) reports on a case of tuberculous epididymitis successfully treated by local injection of dihydrostreptomycin. The patient, a white man aged 52 years, had had tuberculous infection of the cervical lymph nodes in early childhood In 1945 a left nephrectomy had been performed for renal tuberculosis, and then a ureterectomy followed by a left orchidectomy The scrotal skin over the right epididymis was oedematous, reddened, and adherent to the tail of the epididymis, in the epididymis itself there was a firm lump the size of a large grape, immediately above this was a smaller lump the size of a bean The patient was given daily intramuscular injections of 1 gramme dihydrostreptomycin and 1 tablet daily of Chlor-Trimeton Maleate (4 milligrams) orally In addition, crude liver extract was given One month later the lower abscess broke open, and 9 days afterwards the upper one ruptured As a last resort it was decided to inject dihy-

Riaboff, P J (1954). *J Urol*, 72, 716

Metaplasia

Pathology

Metaplasia in the tunica vaginalis testis is discussed by KING (1954) Although it is still held by some investigators that any tissue not normally found in an organ or area must have developed during pre-natal life, there is an increasing body of opinion which assigns this formation, in many cases, to local post-natal development A phenomenon observed frequently, and therefore accepted more readily than have been other changes, is the development of stratified and sometimes squamous epithelium In ectodermal structures it is well

known

squa

know

destroyed. In mesodermal structures,

kraurosis uteri, and in the epididymis

serous membranes; the development of a multi-layered "epithelium" is well recognized. The author records an example of epithelial transformation of the serous lining of the tunica vaginalis testis. It occurred in a man aged 49 years who had had an enlargement of the right side of the scrotum for about 4 years. At operation, thickened tissue, apparently of a cyst wall was removed.

King, E. S. J. (1954). *Aust. N Z. J. Surg.*, 24, 131.

Adenocarcinoma of the excretory ducts

Occurrence in maldescended testicle

LAIRD (1954) reports a case of adenocarcinoma of the excretory ducts of the testicle. Three cases of this condition occurring in

carcinoma does not appear to

patient whom the report conc

testicle. It was of the size and consistency of a normal scrotal testicle, and not soft and atrophic as might have been expected. It was therefore felt that malignant degeneration could not be excluded and orchidectomy was advised. The operation specimen consisted of the testis and the epididymis which was incised to reveal an ovoid, lobulated tumour measuring

ystic growth

the epididy-

a malignant

The author comments that adenocarcinoma of the excretory ducts of the testicle may be intra-testicular, arising from either the straight, the rete or the efferent tubules, or extra-testicular, arising from the epididymis or ductus deferens. The patient made a normal post-operative recovery and was sent for a course of post-operative radiotherapy.

Laird, R. M. (1954). *J. Urol*, 72, 904.

TETANUS

See also B.S.P., Vol. 8, p. 191, S. Key 321.

Immunization

Duration of vaccine immunity

STAFFORD, TURNER and GOLDMAN (1954) discuss the permanence of antitetanus immunization. Since 1940, an increasing proportion of the population of the United States of America has been actively immunized against tetanus; this group, including all members of the Armed Forces and ex-servicemen, and in many areas all children, may amount to 20 million people. The experience of the United States Army has proved the value of active immunization; there were 5 deaths, but only one occurred in a soldier who had been properly immunized and who had received a stimulating dose of toxoid subsequent to his basic immunization. The antitoxin levels in the serum of 175 individuals have been investigated; after initial determinations were made, each subject received 0.5 millilitre of fluid tetanus toxoid intramuscularly and subsequently blood samples were taken, usually at intervals up to 14 days. The subjects were studied in 3 groups: 72 whose last inoculation had been at least 5 years previously, 73 who had received tetanus toxoid within the past 5 years; and 30 who had never been inoculated. A review was made of the case histories of all patients treated for clinical tetanus during the past 25 years; the results indicated that tetanus does develop in spite of the use of prophylactic antitoxin and that the mortality rate is just as high as in those who did not receive prophylactic antitoxin. The results of the investigation demonstrate that actively immunized individuals continue to have measurable levels of antitoxin up to 11 years and retain during this period the ability to produce high levels of serum antitoxin

rapidly in response to a booster injection of toxoid The authors recommend therefore that civilians should receive a stimulating dose of toxoid alone when indicated prophylactically in injuries, when there is reliable history of previous active immunization. The proportion of the population receiving basic inoculation should be enlarged as far as possible, and permanent immunization records established.

Stafford, E. S, Turner, T. B., and Goldman, L. (1954) *Ann Surg*, 140, 563.

Treatment

Tracheotomy and positive pressure ventilation

LASSEN and his colleagues (1954), knowing the success of tracheotomy and positive pressure ventilation in poliomyelitis, decided to apply the treatment to tetanus, in which complete curarization alone will prevent convulsions The first of 4 cases reported was a boy aged 10 years with a scratched knee. When admitted to hospital, he had stiffness and rigidity,

17 days. Pentobarbitone was given for another 5 days, after which recovery was complete. Case 2 was that of a boy aged 11 years, with a paronychia on one finger Trismus and convulsions ensued. On admission, risus sardonicus and rigidity were present. Intravenous tetanus antitoxin, penicillin and sedatives were given After 14 days, a lightning attack of convulsions developed, with cessation of respiration, cyanosis and coma Tracheotomy was followed by general anaesthesia, intermittent at first but later continuous His condition was critical for a fortnight, after which recovery began Case 3 was that of a boy aged 15 years with a hand injury. He had risus sardonicus, trismus, opisthotonus and rigidity Chloral hydrate, tetanus antitoxin and penicillin were given, but 3 prolonged convulsions occurred, with cyanosis. Intravenous atropine, thiopentone and Curacit were administered, followed by general anaesthesia Ventilation was controlled by oral intubation and a high tracheotomy performed When the temperature rose to 107° F continuous anaesthesia became necessary Spasms increased and *d*-tubocurarine was given every 20 minutes. The patient improved and the drugs were reduced Anaesthesia was intermittent until tentatively discontinued. The tetanus disappeared but the pyrexial septic state remained Cardiac failure supervened and the patient died from septicaemia, granulocytopenia and myocarditis. Case 4 was that of a man whose right foot had been crushed. Risus sardonicus, trismus and rigidity were

severe infection of the upper respiratory tract Secondary infection and harmful side-effects of the powerful drugs used in prolonged high dosage must also be responsible for certain complications

Lassen, H C. A, Bjorneboe, M., Ibsen, B, and Neukirch, F (1954). *Lancet*, 2, 1040.

TETANY

See also B S P., Vol 8, p. 199, S. Key 322.

Relation to potassium deficiency

Experimental observations

FOURMAN (1954) reports observations on tetany occurring in 2 normal men in whom an experimental potassium deficiency had been produced. The subjects were depleted of potassium by the administration of an ammoniated exchange resin. At the end of the periods of

known; in sebaceous and sudoriferous glands, the breast, and salivary glands, it is frequently squamous and usually exhibits well-defined keratin. In endodermal structures, it is well known in the thyroid gland; it is common in the pancreatic ducts and the bronchi where it arises specially when the normal epithelium is partly destroyed. In mesodermal structures, it occurs in the body of the uterus, particularly in kraurosis uteri, and in the epididymis. The position is different with the serous membranes; the development of a multi-layered "epithelium" is well recognized. The author records an example of epithelial transformation of the serous lining of the tunica vaginalis testis. It occurred in a man aged 49 years who had had an enlargement of the right side of the scrotum for about 4 years. At operation, thickened tissue, apparently of a cyst wall, was removed; histologically, the tissue was largely fibrous, but in one part there was a portion of epididymis which showed non-specific inflammatory changes. On the internal aspect there was a definite lining; the cells were typically serosal in a considerable part, but they comprised at least a double layer in many areas; other parts showed an increased number of cells and these were stratified. A sharp demarcation of the stratified epithelium from the flattened serosal cells was sometimes observed, especially in the region adjacent to the epididymis.

King, E. S. J. (1954). *Aust. N.Z. J. Surg.*, 24, 131.

Adenocarcinoma of the excretory ducts

Occurrence in maldescended testicle

Laird (1954) reports a case of adenocarcinoma of the excretory ducts of the testicle. Three cases of this condition occurring in scrotal testicles have been reported, but an adenocarcinoma does not appear to have been described before in a maldescended testicle. The patient whom the report concerns was a male aged 21 years with a right maldescended testicle. It was of the size and consistency of a normal scrotal testicle, and not soft and atrophic as might have been expected. It was therefore felt that malignant degeneration could not be excluded and orchidectomy was advised. The operation specimen consisted of the testis and the epididymis which was incised to reveal an ovoid, lobulated tumour [illegible]

testicular tumour with the structure of a disorderly papillary adenocarcinoma. The [illegible] may be intra-testicular, [illegible]

Laird, R. M. (1954). *J. Urol.*, 72, 904.

TETANUS

See also B.S.P., Vol. 8, p. 191, S. Key 321.

Immunization

Duration of vaccine immunity

Stafford, Turner and Goldman (1954) discuss the permanence of antitetanus im- [illegible] of the United States of [illegible] is basic [illegible] tigated; [illegible] tetanus [illegible]

other places responded equally to the treatment. Systemic ACTH and cortisone were given when 6 affections appeared in various places, but were completely ineffective. Hydrocortisone acetate was used again, injected into the places most affected, especially where the thrombophlebitis was near the joints.

Zachariae, L., Schnohr, E., and Zachariae, F. (1954) *Acta chir. Scand*, 108, 37.

Thrombosis of the common carotid artery

Treatment by thrombectomy

Perlow, Daniels and Sloan (1955) describe a case of thrombosis of the common carotid artery treated by thrombectomy. The clinical syndrome has only recently excited interest and the condition is probably more frequent than is generally supposed It is most common [illegible]

acute and severe and the attack may last some minutes or hours and recur after long intervals. Some such attacks are probably explained by vasospasm with partial thrombosis and are scarcely likely with thrombosis and recanalization, since the latter process must be gradual. [illegible]

arteriectomy have been performed but recent opinion suggests that thrombectomy is the best treatment. In the case here reported a clot was removed 16 days after an acute onset of severe and progressive symptoms, the clot extended from the aortic arch and filled the whole common carotid and proximal parts of the internal and external carotids Immediately after operation arteriography showed a good flow through the internal carotid and the circle of Willis, though the middle cerebral artery did not show. The patient died 2 days later and was found to have extensive encephalomalacia It was thought that earlier operation would have saved her and it was noted that the intima of the common carotid was intact despite the prolonged clotting.

Perlow, S., Daniels, J. L., and Sloan, N. H (1955). *Angiology*, 6, 32

Embolism

Progress in management

Warren, Linton and Scannell (1954) compare the management of cases of arterial embolism during the period 1937–1946 with the management of similar cases since 1946. During the first period many patients were referred to hospital too late for surgical treatment Since 1946, however, patients with peripheral arterial emboli have been referred to hospital at an earlier stage and thus better results have been obtained Among the total series of 200 cases only 12·5 per cent of embolisms occurred in patients with no clinical evidence as to the source of the emboli Embolism occurred in 16 per cent of cases in which cardiac operations were performed on patients with mitral stenosis Recurrence of embolism was recorded in 30 per cent of this group of patients. The main arteries of the lower extremities were affected in 51·3 per cent of cases Before 1946 the limb survival rate was 65·9 per cent. Subsequently the rate improved to 86 0 per cent In cases of arterial embolism of the limbs the mortality rates for the two periods were 35 3 and 27·8 per cent respectively The decrease in mortality was due to (1) diminished incidence of cerebral and mesenteric embolism, (2) better condition of patients on arrival at hospital, and (3) reduction in the number of complications produced by massive ischaemia Embolectomy was the treatment of choice for embolism of the aortic, iliac and femoral arteries, but non-operative treatment was adopted in cases of popliteal embolism. Surgery was also employed in cases of embolism of the upper extremity when the hand showed signs of ischaemia Recurrent embolism was recorded in 79 cases. Anticoagulant therapy was used when there was a distinct risk of further embolism.

Warren, R., Linton, R. R, and Scannell, J. G (1954) *Ann Surg*, 140, 311

THYROID GLAND—DISEASES OF

See also B S P, Vol 8, p. 256, S Key 327.

Carcinoma

Classification and review of 190 cases

Cancer of the thyroid is discussed by McDermott and his colleagues (1954). A concept of cancer as living tissue is particularly important in the case of thyroid tumours, because of

absorbed and a slight alkalosis occurred. The potassium deficit persisted. On the sixth day after stopping the resin, one subject was given potassium citrate. He developed mild tetany [illegible] the sixth to the tenth day after stopping the resin, whilst the other subject developed it [illegible] day The contractions were occasionally spontaneous and [illegible] phenomenon could easily be elicited and appeared [illegible] its excitability At the [illegible]

[illegible] potassium deficit was [illegible] the sodium did not leave the [illegible] restored, the sodium both in the body and intracellular [illegible] when the gain in sodium inside the cells may have exceeded the normal sum of sodium and potassium inside the cells.

Fourman, P. (1954) *Lancet*, 2, 525.

THORACIC AND INTRATHORACIC INJURIES

See also B.S.P., Vol. 8, p 203, S. Key 323.

Crush injuries of the chest

Surgical management

Tracheotomy.—CARTER and GIUSEFFI (1954) record further experiences with tracheotomy in the management of crushing injuries of the chest Investigation in anatomical and experimental laboratories demonstrated previously unrecognized effects of tracheotomy, the measure relieves the impaired respiratory mechanism of a considerable work load by eliminating a large proportion of the dead space, and also permits more effective utilization of the tidal air, which in cases of severe chest injury has been reduced to alarmingly low levels. The authors have now used tracheotomy in the treatment of 40 cases, all of which had severe crushing injuries of the chest with multiple segmental rib fractures. The more important signs indicating the need for immediate tracheotomy include: physical signs of extensive rib fracture with paradoxical movements of the loose segments of the thoracic wall, dyspnoea, cyanosis, painful and short respiration; apprehension; and inability to raise accumulating secretions from the bronchi Increasing experience has shown that constant consideration must be given in these cases to severe associated injuries; the multiplicity of thoracic complications which may accompany the skeletal injury to the thorax must also be recognized In the series of 40 cases, 28 had associated injuries of considerable magnitude, there were 12 deaths, 4 of which were due to severe associated head injury. All the tracheotomies were low, and performed with local anaesthesia, aspiration through the tracheotomy tube must be performed carefully, and only for short, interrupted periods There were no complications, such as stenosis of the trachea, haemorrhage, or spreading infection, following tracheotomy. Other thoracic surgeons, from whom the authors made inquiries, have had similar satisfactory experiences with tracheotomy in cases of chest injury.

Carter, B N , and Giuseffi, J (1954) *Arch. Surg* , *Chicago*, 69, 483.

THROMBOSIS AND EMBOLISM

See also B S P , Vol 8, p. 234, S Key 324

Thrombophlebitis migrans

Treatment

Hydrocortisone acetate.—A clinically confirmed case of thrombophlebitis migrans, successfully treated with local injections of 17-hydrocortico-sterone-21-acetate (hydrocortisone acetate, compound F-acetate) is reported by ZACHARIAE. SCHNOHR and ZACHARIAE (1954) The condition occurred in a man aged 29 years who had otherwise been in perfect health. The illness, which had lasted 5 years, manifested itself by attacks of localized reddening and tenderness of an isolated part of one or more superficial veins on the limbs. The attacks usually occurred in the spring and autumn, and lasted for 2–6 months; often several places were affected simultaneously. Microscopic examination showed chronic obliterative endophlebitis and periphlebitis. There were no signs of phlebosclerosis. Treatment by various methods had been ineffective. Hydrocortisone acetate—a total of 25 milligrams—was injected perivenously along part of an affected vein, injections were repeated 3 times at 3-day intervals A fortnight after treatment began, the affection had disappeared It was noticed that, while the phlebitis had previously always left pigmentation, the areas treated with hydrocortisone showed depigmentation of the skin Subsequent new eruptions appearing in

which produce Hürthle cells in the remainder of the gland, and that not all Hürthle-cell nodules are neoplasms. The histological findings indicate that the majority of malignant neoplasms found with Hashimoto's disease arise from proliferating epithelium of the disease process. Although both adenoma and carcinoma may be found in the same gland, they probably represent independent processes, each related to the Hashimoto process but not to each other. Malignant neoplasms are usually papillary and of low malignancy, tending to longer survival where Hashimoto's disease coexists

Morris, E. D, Lindsay, S, and Skahen, R. (1955). *Arch. Surg, Chicago*, 70, 291.

URETER—TRANSPLANTATION OF

See also B.S P., Vol. 8, p 370, S Key 335.

Uretero-ileal sigmoid anastomosis

Prevention of reflux of infected matter into the ureter and kidney

RACK (1954) describes methods of preventing reflux of infected matter into the ureter and kidney when the former has been anastomosed to the bowel. Such reflux causes infection of the kidney and if recurrent will destroy the organ and cause death from uraemia. Animal experiments show that intracolonic pressures exceed those in the ureter even before defaecation begins, and to limit the danger of ascending infection a length of ureter is often passed through a submucous tunnel before it enters the bowel thus producing theoretically a valve-like action. Nevertheless, when established for some time, an anastomosis on these lines usually fails to prevent reflux in the ureter A woman aged 58 years had been treated for carcinoma of the cervix with x-ray and radium but the pelvic organs became very fibrosed, nitrogen retention was marked and a left nephrostomy and soon after a right were performed. The blood urea soon fell and an exploratory laparotomy showed a large pelvic tumour, secondaries in the liver and dilatation of both ureters. As a palliative a left uretero-ileal sigmoid anastomosis was performed and a few days later the left nephrostomy tube was removed and numerous watery motions were being passed The patient died 3 months later [illegible]

Rack, F. J (1954) *Amer J Surg*, 88, 749

Late complications

Acidaemic coma

Treatment —WESTLAKE (1954) describes acidaemic coma after transplantation of both ureters, noting that this was a condition better known to surgeons than to physicians. In the case he describes serial measurements of the *p*H of arterial blood have for the first time been made The patient, a man aged 66 years, had been treated by bilateral transplantation of ureters into the sigmoid and total cystectomy for a bladder cancer. During the following [illegible]

the coma lightened but further glucose and citrate was required and aureomycin was added to the intravenous fluid as a pyelonephritis was suspected It was also necessary to give potassium by the mouth and intravenously. In a week or so the patient had much improved though slight urea retention persisted The blood electrolytes were kept in balance by daily doses of sodium bicarbonate and potassium citrate. It is noted that in patients exhibiting these changes hypokalaemia is also a common finding Symptoms of general weakness and fatigue, hyperventilation, dyspnoea on exertion, and anorexia with loss of weight will suggest the diagnosis

Westlake, E. K (1954) *Brit med. J*, 2, 1457

Destruction of ureteral function

Treatment

Uretero-ileal and pyelo-ileal neocystostomy.—Uretero-ileal and pyelo-ileal neocystostomy are discussed by RACK and SIMEONE (1954). In those cases in which the function of the ureter is destroyed by obstructions secondary to congenital abnormalities, benign post-inflammatory

their biological and histological variability, the protein manifestations of the disease, the endocrinological aspects of many tumours, and the utilization of isotopic iodine A study was made of 190 cases of cancer of the thyroid which were admitted to hospital during 1931–1951; the object was to obtain information which would help to direct treatment along … the biological characteristics of the various types of tumours. The … whose ages ranged from 11 to 83 years The … follicular (localized carcinoma in … differentiated, …

… survival rat… 20 years, 45 per … ars, 11 p… 60 per cent, 20 years, 24 per cent; undifferentiated, 5 years, … per cent; 10 years, 17 per cent. The data relating to the papillary cases showed that there was a pre-existing goitre in 28 out of 89 cases 54 had regional, and 7 had distal metastases on admission; surgical resection was possible in 79 cases, and the hospital mortality was 1 per cent. The … for follicular cases were pre-existing goitre, 27 out of 45 cases; metastases, … ability, in 34 cases; and hospital mortality, 2 per cent; … tre 10 out of 45 cases, metastases, … tality, 11 per cent. … ses and … (1954)

Treatment … radiological improvement in …

McDermott, W. V., Junr., Morgan, W. S., … *J clin Endocrin.*, **14**, 1336.

Crico-thyroid syndrome

Surgical treatment

Referring to operations on the thyroid gland, Harries (1955) stresses the importance of the crico-thyroid muscle and its nerve supply from the external branch of the superior laryngeal nerve. The function of the muscle is to tense the vocal cords Trauma to the muscle or its nerve supply produces a monotone voice; the patient is unable to sing or to alter the pitch of the voice It is recommended that, prior to partial thyroidectomy, the patient's voice should be studied carefully Damage to the muscle and its nerve may occur from direct pressure, during separation of the thyroid gland from the underlying structures, or from fibrous tissue resulting from organization of a blood clot The treatment of a pre-operative case is by careful partial thyroidectomy Harries records 2 cases of the crico-thyroid syndrome. In the first patient the voice was completely restored after partial thyroidectomy, but in the second patient, a schoolmistress, difficulty in talking was experienced when she lectured for more than half an hour

Harries, D J. (1955) *Brit med J.*, **1**, 1012.

Thyroid neoplasms

Relation to Hashimoto's disease

Morris and his colleagues (1955) discuss the relation of thyroid neoplasms to Hashimoto's disease of the gland, their simultaneous occurrence is rare This study concerns 73 patients with both conditions, compared with 207 who had epithelial neoplasms alone and 205 who had Hashimoto's disease alone The incidence of adenomas in the former group was 4·3 per cent, in the latter, 18 5 per cent Carcinoma with coexistent Hashimoto's disease occurred in 17·7 cases. It appears, therefore, that some relationship exists between neoplasms and Hashimoto's disease, but it is unlikely to exist between adenoma and carcinoma in glands affected by Hashimoto's disease This investigation revealed a higher incidence of Hashimoto's disease in women, a higher endemic incidence of adenomatous cases associated with the disease than without, a lower frequency of pressure effects in patients with both carcinoma and Hashimoto's disease. This disease has been regarded pathologically as an epithelial thyroid degeneration with lymphoid infiltration and fibrosis. Williamson and Pearse (1929), however, noted pronounced epithelial hypertrophy. The writers observed that the earlier phases consisted of proliferation of solid groups of epithelial cells within pre-existing follicles, accompanied and, later, overshadowed by lymphatic and fibrous proliferation Nodular lesions containing Hürthle cells were also seen Lymphosarcoma was found in 4 cases. Benign neoplasms occur as adenomas. Of the 36 found in this series, 11 were of the Hürthle-cell type, whereas, of 87 observed in glands without Hashimoto's disease, only 10 were Hürthle adenomas This finding suggests that adenomatous cells are affected by the same factors

fibrosis, intrinsic or extrinsic malignant disease, or by accidental or deliberate interruption of ureteral continuity, drainage from the kidney has been provided by various techniques. In the past 2 years, the authors have used isolated segments of ileum for cases in which both the bladder and rectum had to be removed for malignant disease. Satisfactory results from this procedure led *to the use of isolated segments of ileum to join the interrupted ureter* (or the renal pelvis in one case) to the urinary bladder. A series of 5 cases is recorded, in which mucosa-to-mucosa anastomosis was performed; no difficulties were encountered referable to

[illegible]

normal state even after prolonged obstruction and hydronephrosis.

Rack, F. J., and Simeone, F. A. (1954). *Ann. Surg.*, 140, 615.

URETHRA AND BLADDER: CONGENITAL MALFORMATIONS

See also B.S.P., Vol. 8, p. 383, S Key 336.

Hypospadias

Correction by tunnel-graft urethroplasty

Havens and Litzow (1954) describe their results in 10 years' experience of tunnel-graft urethroplasty for hypospadias. They have employed the 2-stage Edmund's procedure for the correction of chordee, and have been pleased with the results obtained by its use. Tunnel-graft urethroplasty *has not been undertaken for any patient under the age of 15 years*. As criteria of a good result the authors lay down the following conditions: that the patient should be able to have satisfactory sexual intercourse, that he should have a urethra of

[illegible]

not returning to their original homes on completion of treatment. [illegible] by the authors give 46 good results out of 55 patients in whom treatment has been completed. Fistulae have occurred in 18 out of the 46 completed cases, and there has not usually been

[illegible]

advantage of any given method.

Havens, F. Z., and Litzow, T. J. (1954). *J. Urol.*, 72, 677.

URETHRA—NEW GROWTHS AND STRICTURE

See also B.S.P., Vol 8, p 407, S. Key 337.

Primary carcinoma

Prognosis

Hotchkiss and Amelar (1954) report 6 cases of primary carcinoma *of the male urethra* [illegible] patients ranged between 43 and 74 years. In 3 cases there was a previous [illegible] growth was located in the

[illegible]

lymph nodes, [illegible] died were 7 years, some shrinkag[illegible] being that of the 21 years, 2 m[illegible] se studies, as well untreated pati[illegible]

as from the recorded literature that carcinoma of the male urethra implies a bad prognosis. They consider that early metastasis to the regional lymph nodes may be anticipated.

Hotchkiss, R. S., and Amelar, R. D. (1954) *J. Urol.*, 72, 1181.

Condylomata acuminata

Clinical picture and treatment

ventral aspect of the shaft of the penis, one of them underwent suppuration and ruptured spontaneously with the subsequent development of a urinary fistula. A cauliflower-like

subtotal amputation of the penis and transurethral fulguration of condylomas in the remaining portion of the urethra. There has been no evidence of immediate recurrence of condylomas.

Lindner, H. J., and Pasquier, C. M. (1954). *J. Urol.*, 72, 875

Non-gonococcal or abacterial urethritis

Differential diagnosis

Hollis (1954) describes 8 cases of non-gonococcal or abacterial urethritis, with isolation of the pleuropneumonia-like or L organism. Three cases revealed a direct onset following acute gonococcal urethritis with subsidence of the gonococcal infection as revealed by negative smears but with immediate recurrence or persistence of the discharge. Two of these cases did not respond to sulphadiazine after the smears became negative for gonococci following penicillin treatment of the gonococcal urethritis. One case had a 5 months' lapse between the recurrence of a discharge and treatment for an acute gonococcal urethritis. Another case gave no history of a sex contact less than 2 months prior to onset of the discharge. Three more cases gave no history of recent sex contact. The author remarks that these observations are in accord with previous investigations and suggest a venereal transmission of this disorder. Two patients treated with sulphadiazine prior to isolation of the organism showed no response to this drug. Four patients treated with streptomycin alone showed a good response to treatment. The author remarks that this too is in accord with prior observations and it suggests that the good response in 4 other patients treated both with streptomycin and sulphadiazine was due to the streptomycin included in the treatment and not to the sulphadiazine. The author recommends that cases of urethritis of a non-gonococcal or abacterial nature be investigated with reference to isolation of the pleuro-

Hollis, W. J. (1954). *J. Urol.*, 72, 671

URINARY ANTISEPTICS

See also B.S.P., Vol. 8, p. 418, S. Key 338

Treatment of urinary infections

Results in a series of over 1,000 cases

Garrod, Shooter and Curwen (1954) describe the treatment of urinary infections, basing their observations on the results in over 1,000 such conditions. In 75 per cent of their cases an adequate follow-up was possible, and this made clear the fact that observation for some months was necessary to permit proper evaluation of the results. A few years ago hexamine was the only available urinary antiseptic but since then many special diets and new preparations have been employed in urinary infection. It has become evident that any obstruction to the free flow of urine not only makes immediate improvement more difficult

to achieve but also, after apparent cure, favours relapse. Some of the cases investigated had more than one attack and all were included in the series described. It did not appear that failure was often due to using insufficient amounts of the remedies and in general when procaine penicillin was given at least 600,000 units were administered daily while with crystalline penicillin most patients received 1,000,000 units daily. When streptomycin was employed from 1 to 2 grammes were given and at least 1 gramme of chlortetracycline was administered when this drug was chosen. Sulphonamides were usually given in doses of 3 grammes or more Sensitivity tests were carried out by the agar diffusion method in primary culture, but whatever the remedy chosen it was often noted that one strain of organisms, successfully eliminated, had been replaced by another. In males the paracolon bacilli, *Proteus morganii* and *Pseudomonas pyocyanea* are more common than in females, and in the latter *Bacterium coli* preponderate. Catheterization and previous treatment with sulphonamides made urinary infection by *Streptococcus faecalis* more likely. Some infections were quite symptomless so that clinical evaluation of cure was often impossible It was disappointing to find that a previous infection as well as obstruction reduced the chances of cure The six drugs used in the investigation appear to be of almost equal value and the sulphonamides clearly keep their place in urinary infections by reason of their efficacy and low cost

Garrod, L. P., Shooter, R. A., and Curwen, M. A. (1954). *Brit. med. J.*, 2, 1003.

UTERUS—CERVIX; AND VAGINA

See also B S.P., Vol 8, p. 451, S. Key 341.

Carcinoma of the cervix

Radiotherapy

ALLEN, SHERMAN and ARNESON (1954) report on the treatment of 324 patients suffering from carcinoma of the cervix. With radiogold therapy there was a survival rate after 2-4½ years of 91·4 per cent among patients in Stage I of the disease. In this group the parametrium was irradiated with radioactive colloidal gold. Operations revealed that with doses of 50 millicuries in each parametrium satisfactory irradiation was achieved so far as the lymphatic glands were concerned There was evidence of considerable spread of radiogold into tissues beyond the operative area. Carcinomatous tissue was destroyed, but the adjacent tissues [illegible]

the survival rate produced by x-ray and radium treatment after a period ranging from [illegible] months to 4½ years amounted to 56 5 and 48·1 per cent respectively. Nine of 11 patients survived radical operations despite the fact that the lymphatic glands were carcinomatous. After surgical treatment 3 cases of fistula formation were recorded in a group of 70 patients. In these cases the patients had received radiogold and radium therapy followed by Wertheim hysterectomy and pelvic lymphadenectomy. No fistulas developed in patients treated with only radiogold and radium.

Allen, W M , Sherman, A. I., and Arneson, A. N. (1954) *Amer. J. Obstet. Gynec.*, 68, 1433.

Response to irradiation —WAY (1954) discusses the response to irradiation of carcinoma of the cervix at primary and secondary sites He presents the 5-year results of 150 cases of carcinoma of the cervix of Stages 1 and 2. In these cases the response of the primary to [illegible] was [illegible] cept [illegible] cent [illegible] roup were alive and well at the end of 5 years Autopsies on the 23 patients who died [illegible] showed that 7 had residual tumour in the cervix at death; 7 had no residual tumour but had lymph node metastases, whilst the remaining 9 died of intercurrent diseases and had no tumour in the cervix or lymph nodes. In the unfavourably responding group, 51 patients were treated by radium alone: only 6 per cent survived for 5 years. 41 of these died with tumour in the cervix and just over half of them had tumour in the lymph nodes also. Of the

35 cases operated on after radium therapy in whom the reponse was unfavourable, 15 were alive and well at 5 years (43 per cent). The incidence of node involvement in this group was 60 per cent In order to discover the incidence of node involvement in both the favourable and unfavourable groups it was decided to carry out node dissection in the favourably

destroyed in a paracervical lymph node from this case. The more distant nodes showed less response, but the author comments that, at least, irradiation can destroy tumour in the lymph nodes.

Way, S. (1954). *Brit J. Radiol.*, 27, 651.

may show a predominance of the regressive type of cell with a nucleus poor in desoxyribonucleic acid and nucleoli rich in ribonucleic acid Radiation-sensitivity tests may afford help to the clinician as early as the first 2 weeks after the beginning of treatment Specimens for the tests should be obtained from the active growing zone of the tumour rather than from the vaginal surface, for surface specimens have a poor blood supply and are often infected

and moistened with acetoc
and the nucleus takes up
distribution of cancer-cell

irregular and well stained.

Gusberg, S B, Tovell, H M M, Emerson, R, and Allina, Hannah (1954) *Amer. J Obstet Gynec*, 68, 1464.

Treatment by surgery or radiotherapy

operations already mentioned was 31 per cent The total death rate was 12 per cent, following, with 1 exception, anterior or total pelvic exenteration It has been argued that many cancer patients survive for prolonged periods without operation, but it is unlikely that those in this series would all have lived for 3½ years or more without treatment, or at the end of that period have been free from cancer. Patients treated by radiation should be carefully observed for early recurrence in the pelvis Provided no metastases exist in the bladder or rectum, operation short of partial or total exenteration is indicated. The latter procedure, however, has resulted in "five-year cures".

Brunschwig, A (1954) *Amer J. Obstet Gynec*, 68, 776

Control of cancer in the female pelvic organs

Fifteen-year research

MACFARLANE, STURGIS and FETTERMAN (1955) describe experiments continued during 15 years to control cancer of the female pelvis. Over 1,300 cases were examined but at the end of the period only 537 were traced. The women were examined regularly even when supposed to be well, and it was noted that with breast cancers the patients themselves usually discovered the lesion, but in pelvic cancers this was not true, and during the investigation 17 of these were found. Nine of the cancer patients survived. In addition to the cancers 986 benign pelvic lesions were found of which 547 were inflammatory conditions of the cervix thought to be predisposed to cancer. Of these lesions 247 were cured by various methods suggesting that this procedure must have reduced the number of cervical neoplasms. Ovarian cancers could not well be detected in the preliminary stage. It is felt that in women over the age of 30 years periodic examinations as described are desirable at least once yearly. The good [illegible] were of [illegible] ncers, 99 [illegible] 138, or 25 per cent, had no pathological condition The education of women regarding the importance of atypical uterine bleeding should be continued

Macfarlane, C., Sturgis, M. C., and Fetterman, F. S. (1955). *Amer. J. Obstet. Gynec.*, 69, 294.

VASCULAR SURGERY

See also B.S.P., Vol. 8, p 489, S. Key 343

Mitral valvular disease

Surgical treatment

[illegible] gesting pulmonary overfilling or pulmonary oedema The success of the operation depends largely on the specialized training of the anaesthetist and the use of very light anaesthesia with a [illegible] in judging the [illegible] tically [illegible] ent.

Conference on the Surgical Treatment of Mitral Valvular Disease (1955). *Amer. J. Med.*, 18, 326.

Human aortic homografts for arteriosclerotic aneurysms and thrombo-obliterative disease

Structural changes

Structural changes in human aortic homografts have been investigated by DEBAKEY and his co-workers (1954). A study was made of 10 cases in which aortic bifurcation homografts were used to replace excised segments of the abdominal aorta, for arteriosclerotic aneurysms [illegible] and for thrombo-obliterative disease in 2; all the patients were males, and their [illegible] and in one [illegible] id. [illegible]

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the formation of new connective tissue is apparently provided by minute haemorrhages occurring in the media from rupture of newly-formed capillaries, the elastic fibres of the

...

graft revealed no retrogressive arteriosclerotic or calcific changes.

DeBakey, M E, Creech, O, Junr, Cooley, D A, and Halpert, Béla (1954) *Arch. Surg, Chicago*, 69, 472.

Aortic stenosis

Treatment

... stenosis and ... ussed by MULLER

...

cardiography, and fluoroscopy of the left ventricle, demonstrate strain and enlargement of this cardiac chamber. Calcification of the valve does not contra-indicate operation; the majority of suitable patients have calcified aortic valves Patients whose lesions are in the higher grades of severity, particularly, should be given digitalis and mercurial diuretics, along with bed rest, pre-operatively, to achieve the best possible conditions Young persons, who have an intense murmur only, are otherwise asymptomatic, and have a narrow pulse pressure and low systolic blood pressure, might be considered for operation later, when the operative procedure has proved satisfactory, in such patients, whose valves are not calcified and are more likely to split along the fused commissure, producing a competent valve, and whose left ventricular reserve has not been depleted, good results may be expected Contra-indications include poor myocardial reserve, complete heart block, subacute bacterial endocarditis, and acute rheumatic fever. In a series of 13 patients, 10 survived operation more than 4 months, in 9 of these 10 the results were good to excellent There was one operative death, in a man aged 63 years, who died while an attempt was being made at a retrograde approach through the innominate artery

Muller, W H, Junr, and Hyman, M (1954) *Surg Gynec Obstet*, 99, 587

Thrombo-obliterative disease of the aorta

Surgical treatment

DEBAKEY, CREECH and COOLEY (1954) describe the surgical treatment of thrombo-obliterative disease of the aorta in a series of 22 males whose ages ranged from 33 to 63 years Twelve patients had partial occlusion of the aorta; in the remaining cases the occlusive

but 16 patients the ...

should be performed for this condition. In contrast, the operation may be contra-indicated when the occlusive process is partial, less localized and accompanied by peripheral arterio-sclerosis obliterans.

DeBakey, M. E., Creech, O., Junr., and Cooley, D. A. (1954). *Ann. Surg.*, 140, 290.

VEINS—VARICOSE

See also B.S.P., Vol. 8, p. 529, S. Key 344.

Gravitational ulcer

Clinical picture and treatment

WRIGHT (1953) describes gravitational ulcer, observing that pain may be present or absent, varices may be obvious or invisible, deep venous thrombosis may precede ulceration or may be absent. With progressive venous stasis an area of skin becomes pigmented, indurated, oedematous, fibrotic, and then with an impaired blood-flow and minor injury an ulcer forms. Rest or support often cures the oedema and with it the ulcer. In some cases arterial insufficiency alone causes ulceration but this is rare. Competence of the valves in the deep veins is essential to an adequate venous return and when this is lost the result is varicosity of superficial veins. Repair of damaged vein cusps is not possible and superficial varicose veins with a positive Trendelenburg sign always indicate some deep vein incompetence. Dissection of legs showing gravitational ulcers may show thrombosis or dilatation and tortuosity of deep veins, but contraction of the clot and adhesion to the wall frequently permit recanalization. Varicosities of the internal saphenous vein will recur after high ligation and are only prevented by tying at the sapheno-femoral junction. Reflux into the main superficial veins is preventable if they are divided where they enter the deep vein and incompetent communicating veins permitting reflux may be reduced by sclerosing fluids or excision. Sclerosants are unlikely to cause damage at a distance if they are viscid, injected high, and in small volume. The location of communicating veins is not always easy for they are not constant in number or position and tourniquet tests give little information for the reasons described. It is not possible to tighten a tourniquet to occlude the superficial veins ... the condition and

...

sants, and any communicating veins found incompetent are divided between the deep fascia which is then sutured. The deep venous return is aided by the support described, exercise, and the reduction of weight.

Wright, R. B. (1953). *Lancet*, 2, 1273.

VITAMINS AND NUTRITION IN RELATION TO SURGERY

See also B.S.P., Vol. 8, p. 565, S. Key 347.

Malnutrition in surgical patients

Treatment

... the treatment of malnutrition, particularly ... to make clear the ... ctors. In general, ... e gastro-intestinal ... with theore- ...

be increased if the tissues require building up rather than maintenance. Five per cent dextrose solutions are isotonic, may be mixed with other substances, and provide 200 calories for each litre administered Local irritation of the vein and perhaps thrombosis often develop if stronger solutions are used, and strict precautions are needed to prevent sepsis around

isotopically for within a few hours a high proportion of the injected radioactivity may be recovered in the expired carbon dioxide.

Waddell, W R., Gever, R P, Grillo, H. C., and Stare, F. J. (1954). *Amer. J. Surg.*, 88, 698

NOTER-UP, 1955

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